THE BOOK WAS DRENCHED

MAN'S ADAPTATION OF NATURE

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Studies of the Cultural Landscape

BY

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WITH SEVENTY-NINE ILLUSTRATIONS
IN THE TEXT AND FORTY-SIX PLATES

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PREFACE

THIS book is an attempt to set out for consideration a philosophical conception of human geography.

Speaking on two occasions recently, Sir Halford Mackinder suggested that the time has come for geographers to "build up a philosophical geography, originated by observation and speculation no doubt, but tested by criticism" (*G.J.*, p. 269, September, 1931). Should it be possible to agree upon some central thesis to form the core of the subject, the work of observation, discussion, and criticism will be enormously simplified.

While fully recognising and in no way desiring to detract from the value of the contributions made to the subject by explorers, geologists, physiographers, climatologists, surveyors, cartographers, economists, historians and others in the past, the writer believes that the time has come when an attempt, however tentative, should be made to formulate a philosophical geography in which the heart of the subject is defined from the standpoint of the geographer as such and in terms as definite and clear-cut as any similar statement which can be made about any other science. If the core of the subject can be thus defined, the boundaries can safely be left to look after themselves.

Many feel increasingly that that core is to be found in the fact that human activity, which takes place to satisfy human desires, adapts and modifies Nature, and is itself adapted and modified by Nature. The natural landscape is thus changed and the concrete expression of this process of adaptation and modification is the cultural landscape, that is, the natural landscape as modified by man. Because of its very nature, therefore, the cultural landscape, including man, is the objective expression of the relationship between human activities

and natural environment. The cultural landscape presents a fourfold aspect. It has structural form as in fields, mines, houses, and factories. It possesses movable forms as in the cases of men and vehicles. It has activity expressed in the operations of seeding and harvesting, manufacturing processes, and the movement of vehicles. Lastly, it has the results of these activities in the form of crops, manufactured products, the transportation of goods and people, the production of health, good government, and amusement.

To every student of the relationship between human activity and natural environment the cultural landscape forms the core and heart of his subject, the central point to which he in the first instance directs his attention, since the cultural landscape states concretely the problem he has to investigate, is indisputably a fact and not a theory, and definitely challenges explanation. He thus begins with a statement of his problem, as is done in Mathematics and other sciences, and follows with the solution or explanation as far as is possible in terms of the geographical factors which influence human activities, working those factors into his explanation in their appropriate places having due regard to their relative importance. Though it may not be possible in all cases to begin with a complete statement of the cultural landscape, the student can always begin with some aspect or aspects of it such as the distribution of population or crops or products or roads or railways.

This book attempts an analysis and classification of the features of the cultural landscape, suggests methods of studying them, discusses natural environment in relation to them, and in a series of detailed studies examines in relation to environment the cultural landscapes of selected activities and areas. In a book of this size it is not possible to treat these areas exhaustively, but it is hoped in further books to apply in greater detail the methods given in Chapter 4.

It is suggested that for some purposes students may find it useful to read Chapters 8 to 15 before reading the other chapters.

It may help and encourage some students and others to state that the bulk of the illustrations appearing over my initials were taken with a V.P.K.-size camera, fitted with a F 4.5 lens, the full aperture of which was seldom used.

I am indebted to the Controller of H.M. Stationery Office for permission to base the house patterns diagrams on the 1-in. O.S. maps. For permission to make use of various illustrations indicated in the text, I am indebted to *The Times*, and to the National Development Bureau of Canada. I have also used material prepared by the U.S.A. Department of Agriculture, the U.S.A. Department of Commerce, and the U.S.A. Geological Survey. To these departments I tender my acknowledgments and thanks.

I wish to express my special indebtedness to Sir Halford Mackinder and Professor Sargent, whose lectures and writings have been a source of much inspiration; and to all those other writers and speakers whose views and information have been freely drawn upon, and in particular to Professor Fleure for reading the substance of Chapters 2, 3, 4, and 5 in manuscript and making valuable suggestions. I am also much indebted to Professor Fawcett for reading Chapter 7 in manuscript and for helpful suggestions; to my sister-in-law, Miss Lamont, for careful reading of the proofs; to Mr. R. Warden Harvey, M.Sc., Honorary Photographer, University College, Leicester, for help in preparing the views of the Corn Belt, and for much photographic advice and assistance; to Mr. Skinner, of University College, Leicester, for help in preparing the diagrams for Chapter 7; to Mr. W. Stanley Murrell, of the University of London Press, for his unfailing courtesy and helpfulness and for the care and attention he has given at every stage of the preparation of this volume; and to my wife for help in proof reading and for unceasing encouragement and sympathy which have done much to make this book possible.

P. W. Bryan.

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Chapter 1

THE GROWTH OF GEOGRAPHICAL IDEAS

The development of geographical ideas from the early Greek view of geography as a description of the earth to the modern conception of human geography as a study of the adaptation of Nature or natural environment by man in the process of satisfying his desires.

THE word 'geography' means a description of the earth. It is derived from two Greek words meaning to write or describe the earth.[1] Hence, according to the original sense of the word, any spoken or written description of the earth constituted geography or geographical description. In the fifth century B.C., Herodotus, a keen observer, travelled widely in the somewhat limited extent of the then known world. Based partly on personal observation and partly on the verbal descriptions of others, he has left us a series of fascinating accounts of peoples and their environments. By some he has been called the father of history, but there is little doubt that Herodotus was much more of a geographer in the original sense of the term than he was an historian, for his plain accounts of the manners and customs of people and their differing geographical settings, bear a close relationship to our travel descriptions of later ages.

From the earliest times man has been particularly interested in his natural environment. To the early writers natural phenomena loomed larger, appeared more formidable, more forbidding, and less controllable than they do to-day. It was difficult for them to conceive of man as apart from his environment. In a country differing from their own the strangeness of the topographical features, the deserts, hills and streams, the vegetation, animal life, the human foods, the manners and customs of the people, and their racial character-

[1] *Ge*, the earth; *grapho*, I write or describe.

istics, were inextricably mixed and formed a whole which needed to be so described. So it appeared to Strabo, who, born in 65 B.C., wrote what is probably the greatest work undertaken in early times, and, in some seventeen volumes, gives us a general geographical account of the countries of the earth as known at the end of the Augustan age.

In this work we have the first scholarly treatise on geography. Of geography he says: "In addition to its vast importance in regard to social life and the art of government, geography unfolds to us the celestial phenomena, acquaints us with the occupants of the land and ocean, and the vegetation, fruits, and peculiarities of the various quarters of the earth, a knowledge of which marks him who cultivates it as a man earnest in the great problems of life and happiness" [1]. This passage makes it clear that geography to the Greeks was a description of man and his natural environment in the very fullest sense of the phrase as then understood. Centuries before the Christian era it was thus a recognised subject for study whose field embraced the entire universe. From the nature of its content it can very properly claim to be the mother of the natural sciences. This view was excellently put by Professor Harlan Barrows, of the University of Chicago, in addressing the Association of American Geographers in December 1922. He said: "As time passed, geography bore many children, among them astronomy, botany, zoology, geology, meteorology, archæology, and anthropology. Some of its offspring have pursued independent careers in the world of science for so long a time that quite naturally their relation to the mother subject commonly is entirely overlooked. Each attained its independence by taking over a part of the parental estate whose cultivation involved distinctive tasks and by working at it more intensively than the parent had done. Thus each child became a successful specialist, while the parent, though it relinquished most of its original domain, still retained multifarious interests" [2]. As a result, geography was in some danger of losing that wholeness or unity which had been its distinctive feature.

Down to the middle of the nineteenth century the development of the subject follows two main trends. On the one hand we have the growth of the specialist subjects indicated above, on the other a continuation of the general description of the earth and its inhabitants. This latter part of the subject was based on the accounts of new countries made available through the work of the long and distinguished list of adventurers, explorers, merchants, and mere travellers who, from the time of Herodotus down through the period of the great discoveries in the fifteenth and sixteenth centuries, through the period of the opening up of western America, Africa, and Australia in the seventeenth and eighteenth centuries, to the crossing of the Rub Al Kali, the Empty Quarter, by Bertram Thomas in the twentieth century, have gradually unfolded to us a clear picture of the spherical world as we now know it to be.

The type of geography inaugurated by the Greeks through the attempt to describe fully and adequately the surface of the earth and its inhabitants is still with us. We see it in the gallant attempts of men like Andrée, Scott, Shackleton, and Amundsen to wrest their remaining secrets from the Polar regions. We see it in the efforts of men like Stefannsson to prove that the hitherto believed inhospitable areas within the Arctic circle may in the future prove as possible for the support of human beings as the once considered uninhabitable plains of western Canada. The work of these men, and of many others, serves to remind us that the task of recording, even in the broad outline of the traveller, some of the major geographical facts is still incomplete. It forms a fascinating department of the subject, this geography of description and record of conditions in distant lands, and its work is focused in such great societies as the Royal Geographical Society in London, and many others abroad.

Since the middle of the nineteenth century there has grown up side by side with the geography of travel what has been called somewhat loosely the 'new geography.' In essence it laid emphasis on causal relationships in place of description.

It has taken shape along two main lines and under a variety of influences.

First under the distinguished impulse of Humboldt and Ritter, and later under a series of great geologists and physiographers such as Jukes Brown in this country and Davis in the United States, the explanation of the origin of land forms, the surface shapes of hill and valley, mountain and plain, in terms of the complex interaction of rock material, weather conditions, and structural movements, developed as the main portion of what we have now come to call geomorphology, a branch of physical geography. In other words, those interested in the subject of geography ceased to be satisfied with a mere description of man's habitat, and devoted themselves to what is ever more interesting than mere description, namely, causation or explanation. Partly with the aid of government money available in government departments for geological studies, the literature on this aspect of the subject has increased to gigantic proportions. This is more particularly true of the United States of America, which presented such a striking series of physiographical features as to attract geologists to their study to such an extent that geologists became in large measure geographers. Among the most distinguished of these in the early fifties was Lesley, at one time head of the Geological Survey of Pennsylvania. Of his work when studying the Pennsylvanian Mountains, he writes: "In the absence of rare minerals and abundant fossils nothing remained to study but dynamic forms, and these so numerous, so grand, so variously grouped, that they excited a perpetual enthusiasm and led on to infinite research. . . . Years of patient toil it took us to unfold the mysteries of the Pennsylvanian and Virginian Range—a tangled hank to be untangled thread by thread and rearranged skein by skein—a tracery more elaborate and intricate than Gothic or Arabesque—Nature's primeval labyrinth, in which the minotaur was but a form of science cast in metal and sculptured in stone" [3].

Of the land forms he says: "They were a world of the exhibition of natural forces by itself, and as such we took

possession of it and settled in it as our fathers did in the valleys themselves, and thus became not mineralogists, not miners, not learned in fossils, not geologists . . . but topographers, and topography became a science and was returned to Europe and presented there . . . as an American invention."

In this way the geologists of Pennsylvania, back in the fifties of the last century, helped to establish the great principle that surface form is intimately related to the rock structure beneath, and incidentally helped lay the foundations of physiography on a scientific basis, and made the central feature of geography a study of one aspect of environment—a view of geography from which up to lately we were struggling hard to free ourselves. They did, however, aid in the great service of first placing geography on a definitely scientific, as opposed to a merely descriptive, basis.

From their work, and that of others in the same field, notably Suess and de Margerie, emerged the concept of natural environment as consisting of different stages of the erosion cycle, within which earth, slowly emerging from the sea, is attacked by weather agencies, carved into many differing surface features of hill and valley, mountain, plateau and plain, the varying shapes depending on the degrees of resistance of the material of which the crust is composed, the whole modified by structural movement to an extent still imperfectly understood, and the debris resulting from the complex process being carried back to the sea to form the nucleus of new lands as yet unborn. In essence the above is but one aspect of the Greek view of geography, classified and systematised as a study of and explanation of land form on modern scientific lines, and as such forms an essential part of the study of human environment.

The second main path followed by geographical development in the last century culminates in the viewpoint that man is the central feature of the subject. In process of development it has been variously termed human geography, economic geography, anthropogeography, according to the nationality and precise outlook of its exponents. It lays the emphasis on

man and his activities in relation to his natural environment rather than on the land forms or natural environment itself.

It began with Ritter and Humboldt in the early part of the century. In 1649, Arnold Guyot, a disciple of Ritter and a colleague of Louis Agassiz, followed the latter to Boston and wrote *The Earth and Man.* This book endeavoured to correlate man and his environment in a very broad way. Although Guyot became Professor of Geography at Princeton, he exerted little influence on the development of the subject, which in the United States of America had largely passed into the hands of geologists. His book was, however, one of the first important contributions to the development of human geography following Ritter. Its further development is largely connected for many years with Europe, and, as has been excellently depicted by Newbigin [4], owes much to the influence on contemporary thought of Charles Darwin's work. While Darwin is chiefly remembered for the part he played in developing the theory of evolution, there is an aspect of his work which is of greater interest to the geographer. He showed, as Dr. Newbigin has put it, " that there is a delicately adjusted balance between organisms and their surroundings, taken in the widest sense."

Darwin was thus among the first to study scientifically the relationship of organisms to their environment, by examining the adaptations of plants and animals to their natural habitats. He thus gave a great impetus, through the publication of the *Origin of Species*, to the study of environmental relationships in general. The early Greek conception consisted, as we have seen, of the study of the earth primarily as the home of man. From this conception, geographers, with the breaking away of offshoots of their subject as separate sciences, had to some extent departed. The work of Darwin, among others, both consciously and unconsciously, directed geographers' minds back again to the Greek concept, or rather to an improved version of it. That process of redirection is still in progress.

While Darwin placed the study of organisms on a scientific basis, Ritter, earlier in the century, had insisted that the

central principle of geography must be "the relation of all phenomena and forms of nature to the human race." In the latter part of the century Ratzel, in Germany, and his interpreter Semple, in the United States, and Vidal de la Blache and Brunhes, in France, have done much to develop what has come to be called human geography. As Ratzel and la Blache represent two somewhat opposed schools of thought, and the two main schools of thought as yet developed in Europe from Ritter's 'principle,' we may examine their teachings briefly.

Anthropogeography, as developed by Ratzel and interpreted by Semple, consists, in essence, of a classification or systematisation of natural environment, based on the influence, or rather in their view, control, which the different types of environment exercise on human activities. Their approach is definitely from the environmental side, and the stage on which human activity takes place, is regarded as being definitely determinative and not permissive. The emphasis is thus laid on the side of physical circumstances, and the fixed character of, and the inevitability of, the control exercised in any given set of natural conditions, is dogmatically asserted. To the views of the Ratzelian school the term 'geographical determinism' has been applied. The Ratzelian view may be criticised on the ground that it prejudges that which it purports to investigate—the relation between man and his environment—and that the facts adduced are insufficient to support the dogma of the generalisations. Further, it is clear that man is in many cases the active agent moulding nature to his will.[1]

Contrasting sharply with Ratzel's teaching is that of la Blache and Brunhes, which lays the emphasis on man and his activities, and on the power of human groups to adapt the

[1] It is only just to state that, according to Professor Solch of Heidelberg, the more generally accepted modern German view considers geography to be in essence a study of place relationships, and while the emphasis is laid on the side of the physical environment rather than on that of man, the controlling influence of natural environment is much less dogmatically asserted than was done by Ratzel.

physical circumstances to their needs within limits. Man, while influenced by, and in some respects definitely controlled by, his natural environment, is regarded as the master and not the slave of circumstances. In other words, the subject is approached from the standpoint of man's adaptation of his environment, rather than from that of environmental influence. Thus the unsuccessful attempt to explain everything in terms of physical environment implied in the geographical determinism of Ratzel, is avoided, and the emphasis is laid on co-operation between man and his environment rather than on the coercion of man by his environment.

As between these two views there is little doubt that the Ratzelian view offers least and the la Blache view offers most for the future of the subject, and is further the more scientific and less dogmatic of the two. Let us examine it and its development with a view to seeing if it can be more concretely expressed.

Botanists have familiarised us with the word 'ecology.' By 'plant ecology' the botanist generally means the study of plant groups and communities in relation to the specific area in which they are found, and with special reference to the way in which natural conditions influence these groups. Thus certain groups of plants, for example heather and gorse, have adjusted themselves to and have to some extent modified, specific environments. Applying the same idea to human groups or communities, it is possible to study the way in which specific human groups or communities have adjusted themselves to and modified the natural conditions in which they live. It is to the study of this adjustment or to what Barrows has called human ecology that some geographers are directing increasing attention. According to Barrows, if human ecology be accepted as the controlling point of view in geography, then three major divisions of the subject can be "recognised, namely, economic geography, political geography, and social geography, corresponding to the three great types of human activity that are related to the earth" [5]. Economic geography has as its field and controlling point of view man's

adjustment to nature in the effort to wrest from her a living; political geography treats of man's political activities in so far as they are influenced by natural conditions; while social geography deals with the relationship between man's social life and the physical environment in which it takes place. Cartography, the geography of exploration, plant geography, geomorphology, etc., each has its place in relation to such a division, as contributory branches which aid by recording and describing the facts of natural environment, but no one of which individually presents what some feel to be the essential geographic outlook, the adjustment of the human community to the natural environment in which it has developed.

One of the main difficulties in the viewpoint of geography as human ecology, would appear to be the implication that man has adjusted himself to nature rather than that man has adapted nature in the effort to satisfy his needs. Both are in a sense true, but in the main it would appear more and more clear that man has adapted nature rather than adjusted himself and his activities to nature. Hence it would appear to be desirable to lay the emphasis on the process of adaptation. A further criticism directed against the ecological view is that it tends to produce an evolutionary or historical study rather than a purely geographical one. In a recent address Sir Halford Mackinder has put this difficulty. He said: " . . . There is a little danger that we should mix history and geography without seeing clearly what we are doing . . . geography proper is a description of things in the present. Geography should as I see it be a physiological and anatomical study rather than a study in development. As its name implies, it should be a description with causal relations in a dynamic rather than in a genetic sense." He further said: " But there is a true historical geography, a study of the historical present, an idea and expression familiar to all literary folk. In that case the geographer has to try to put himself back into the present that existed, let us say, 1,000 or 2,000 years ago; he has got to think of the geography of that time complete: he has to try to restore it " [6]. In other words, the geographer's

business is to take things as they are or were, and to explain them: he is concerned with space rather than with time.

Immediately we are forced to ask ourselves what things? Sir Halford in his address to the Geographical Section of the British Association at the Centenary Meeting in 1931, advocated the claims of the hydrosphere to be considered as the central theme of geography. He defined the hydrosphere in terms of his address to the International Geographical Congress at Cambridge in 1928, as "the totality of water on the earth whether gathered together in the ocean, or invisible in the air, or condensed in the clouds, or falling as rain or snow, or creeping down in the glaciers, or coursing down in the rivers, or percolating underground, or rising in the sap of plants, or circulating in the arteries and veins of animals" [7]. He made it clear that he included man's blood and therefore his life. He was thus claiming that the activity resulting from life and climate in relation to the earth was the central theme of geography. While this definition adequately covers geographical relationships in the broadest sense, it includes much to-day dealt with by specialists, for example, by the botanist in studying plant ecology, the zoologist in studying the relations of animals to their environment, and the physiographer in studying the circulation of water. Geographers may well study the threefold circulatory system on the face of the planet—blood, the essence of animal life and man; sap, the essence of plant life; and water, which enters into the other two—as a whole, in a way no other subject can, but in order to bring out the essential wholeness it seems, perhaps, desirable to study it with one of these as the central objective. It is clear that neither a study of topographical and structural relationships, nor climatic relationships, nor the relation between vegetation and environment, will give this sense of wholeness. The essential wholeness of the geographical outlook would appear to be most satisfyingly brought out by taking man, as the highest form of life and the highest expression of the circulation or hydrosphere, in relation to his physical environment, as the central objective on which to lay our chief emphasis, with

the other features of the hydrosphere fitting into their due places. This sense of wholeness in relation to a definite objective would appear to be the most satisfying hall-mark of the geographical outlook. It is in this narrower sense of the hydrosphere regarded as the home of man and the scene of his activities, in due relation to the lithosphere and the atmosphere, that the subject is treated in the chapters that follow.

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Chapter 2

ANALYSIS OF THE CULTURAL LANDSCAPE

An analysis of the cultural landscape as the concrete or objective expression of the process of adaptation in which man has modified his natural habitat, and the natural habitat has in turn modified his activity. The anatomy and physiology of the cultural landscape: its fixed and movable elements. The cultural landscapes of shelter, arable farming, and pastoral farming. A descriptive formula for the cultural landscape.

We have seen in the first chapter that our viewpoint is to be found in the adaptation by human activity of the natural environment in which that activity takes place. Fundamental to a clear concept of this view is the fact that all human activity takes place in response primarily to the demand for the satisfaction of human needs and desires, and not in response to the controlling influence of environment. This demand is to satisfy the need for food, shelter, and clothing, and over and above these more elementary wants a whole range of other desires and needs of a less urgent type, such as the demand for political institutions, recreational facilities, and the satisfaction of the æsthetic sense. Human communities engage in activities to satisfy these demands roughly in the order of their respective urgencies. Thus the satisfaction of demand is the driving force behind all production and the performance of services, whether it or they be undertaken to provide food or clothing or shelter, city halls or golf-courses, beautiful gardens or vistas. In thus engaging in activity man utilises and modifies natural products and natural conditions. He thus modifies his natural environment and is in turn modified by it. This double process is the actual process of adaptation.

In this view the geography of any area presents a threefold aspect. On the one side we have a human group actively

engaged in the effort to satisfy human wants. On the other we have the natural environment of land forms, rock structure, climate, vegetation, and animal life. Between the two and acting as the central core of the tripartite division is the relationship between the activity of the community and the natural habitat, such relationship being dependent on man's effort to modify the environment to satisfy his needs, and the 'effort,' as it were, of the environment to modify and limit his mode of doing so. Thus in each region a human community forming a complex organism develops a highly intricate composite activity, which, in psychological phrase, we might call the human activity complex. This is set in a natural environmental complex made up of the various elements of the natural environment. Geography, in this view, is not primarily a study either of the human activity complex, or of the natural environmental complex, but of the adjustment of the one to the other.[1]

Unless human activity is considered first in this study we have no principle on which to base our selection of the facts of human activity. It is becoming increasingly clear that the geographer's approach to his subject through human activity is more fruitful than that through environment, since in the former case he has ready to hand a measuring rod wherewith to select for study the environmental facts which affect human activity. The environmental approach leaves us without such a measuring rod and forces us to study all the facts of environment. It is clearly impossible, even were it desirable, to consider under the head of geography all the facts of natural environment. Climate is a part of natural environment. If we study it fully we become not geographers but climatological

[1] As thus expressed, this view was first suggested by the present writer in a paper read to the Geographical Association in January 1929, and published in condensed form in *Geography*, March 1929, as "Natural Environment in the Corn Belt of North America," part of the substance of which appears in Chapter 8 of this book. It was further developed in a paper read to the Geographical Association in January 1931, on "The Distribution of Houses in England and Wales as a Population Index."

experts. The attempt on the part of geographers to study in this way each section of environment breaks down. To study climate as geographers we must approach it not through the eyes and training of a climatologist, who will inevitably lay the emphasis on climate as such, but through the eyes and training of a geographer, that is, of one to whom the relationship between human activity and natural environment is the main object of study. The differences between the sciences lie, not in the material they use, but in their selection and treatment of the material in relation to some clear-cut central principle. This principle in human geography would appear to be the interaction of the human activity and environmental complexes, or the human activity organism or group as related to its natural habitat.

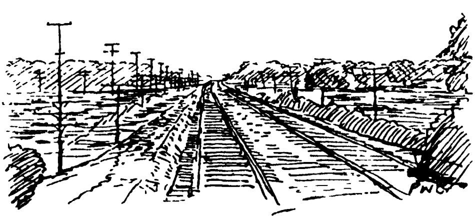

FIG. 1.—LEVEL RAILROAD TRACK, WESTERN AMERICA.

Both human activity and natural environment are made up of concrete facts and processes. The relationship between the two is primarily an abstraction, though more or less capable of concrete expression. Man's struggle to adapt the natural environment to his needs is deeply graven on that environment. The concrete expression of the process of adaptation takes the form of the cultural as opposed to the natural landscape, in other words, it is the natural landscape as modified by man. It is the concrete expression of a double process, man's effort to mould nature to his will, and nature's modification of what would otherwise be man's unrestricted activity.

The effects of this double process are well seen in such an element of the cultural landscape as a railway track. When man, in response to the demand for transportation between centres, constructs a railway line, he modifies the natural landscape by making a level roadbed and laying on it lines of rail (Fig. 1). He adds many other features, such as stations, signal-boxes, signal posts, level crossings—all of which are

necessary irrespective of the nature of the topography. He thus introduces into the natural landscape elements which were not there before, and to that extent may be considered as having modified the natural landscape in response to the demand for transportation facilities. But there are few areas so devoid of topographical features that he is not forced to take the relief into account and modify his constructional work

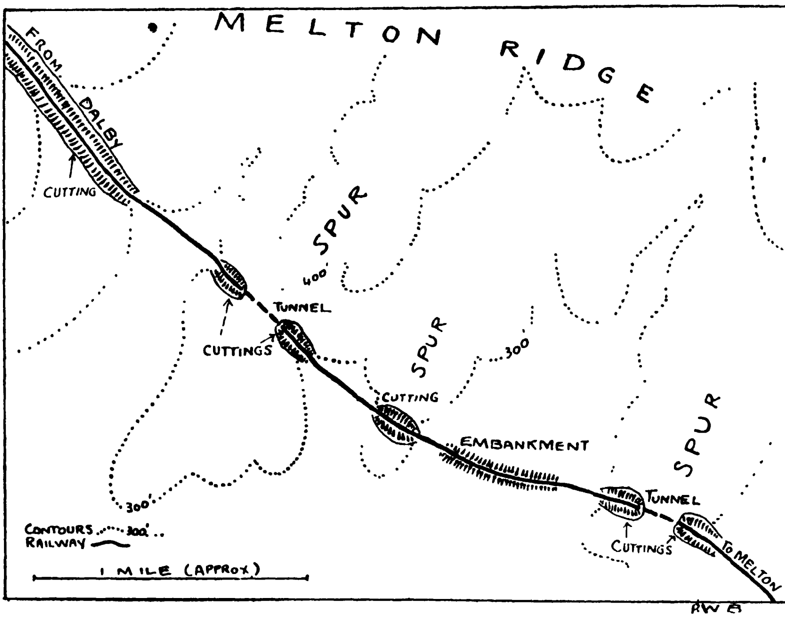

FIG. 2.—SKETCH-MAP OF PART OF THE RAILWAY BETWEEN DALBY AND MELTON IN LEICESTERSHIRE AS A FEATURE OF THE CULTURAL LANDSCAPE OF TRANSPORT.
Note cuttings, tunnels, and embankment.

accordingly. Between Nottingham and Melton Mowbray (Fig. 2) the railway line connecting the two centres is faced by the obstacle of the Melton Ridge. To maintain a reasonable grade it is forced to tunnel. To ease the approach to the tunnel, cuttings are necessary at each side. On the south side of the main ridge, a series of spurs with intervening valleys cross the line. At two points further tunnels are needed, approached by cuttings. Through a lower spur a cutting is sufficient. Across a wide valley to maintain a grade for reasonably economical working, an embankment is thrown.

To the extent that in satisfying the demand for these railway facilities man departs from the level, straight-line track between the two points, to tunnel, make cuttings, embankments, or introduce other modifications such as change of direction, his activity is being modified by nature. Thus man's activity modifies the face of nature and is in turn modified by nature. The objective expression of all this is the railway track as thus modified, with its cuttings, embankments, tunnels, etc., forming a prominent unit of the cultural landscape.

In similar fashion we can think of man's various forms of shelter, his houses, factories, warehouses, shops, and offices, as the expression of his endeavour to adapt nature to his need for shelter, or, if we prefer the phrase, as the expression of his adjustment to nature in attempting to satisfy the demand for shelter or the need for shelter. His fields and growing crops, his barns and fences, express his strivings to adapt his environment to satisfy the need for food and raw materials ; his coal dumps, adits, spoil heaps, and pithead gear, represent an environmental adjustment to the need for power and warmth ; his roads, railways, waterways, and terminal facilities fulfil his need for transport and social unification ; his council houses and police stations express his need for community organisation for administrative purposes and the maintenance of law and order ; his playing-fields satisfy his need for recreational facilities ; his towns and cities are highly specialised organs of the complex community organism, without which his elaborate system of exchange, whereby the surpluses of different areas are made universally available, would cease to function, with results almost as serious as the stoppage of the heart would have on the human body. Throughout all of this is man himself, at work or at play, moving, standing, or sitting—an essential element of the cultural landscape, and the motivating force of it all in the effort to satisfy his needs.

To the extent that man in any or all of these activities, modifies or is modified by the natural landscape, the study of such modification comes, in this view, under the head of and

within the purview of our subject. Since the objects forming the cultural landscape vary in character, shape, size, and distribution, both with the activities of the community and the nature of the environment, the cultural landscape is the best available objective expression of the relationship between human activity and natural environmental conditions. Further, since the geographic argument can usefully proceed from the facts of human activity to the interpretation of those facts rather than from the physical setting to the human modification, the very core and heart of human geography is the observation of and the explanation of the cultural landscape.

A great geographer, Sir Halford Mackinder, has recently said: "Geography should be a physiological and anatomical study rather than a study in development" [1]. The study of the cultural landscape is essentially an anatomical and physiological study. The structural facts of that landscape—the houses, fields, and railway tracks—constitute its anatomy, while the growing crops, the moving animals, the seeding and harvesting, the movement of commodities, the processes of manufacture, the playing of games, and man himself, are all parts of its physiology. It is a study of the living present as concretely expressed through man's adaptation of nature in the effort to satisfy his desires.

By concentrating in the first instance on the anatomical and physiological facts of the cultural landscape we avoid the common criticism directed against our subject of a certain 'woolliness' and falsity of deduction which arises when we attempt to reason from the physical environment to man's activity. As students of the cultural landscape, the material which we have to study is made up of facts which are as definite, as concrete, and as indisputable as is the material studied by the chemist, the botanist, or the geologist. The cultural landscape forms the central point to which we can in the first instance usefully turn, since it concretely states the problem we have to investigate, is indisputably a fact and not a theory, and definitely challenges explanation.

As students of human geography, then, engaged in the study

of any area, our first step should be to observe, describe, and place on record the facts of the cultural landscape; our second, to explain it, in so far as such explanation is possible in terms of the physical setting. As we go from point to point throughout the countryside and through the villages, towns, and cities, we see the fields, the farms, the houses, the factories, the roads and rails. These form the units of the cultural landscape. We cannot help observing them. They are best studied first-hand in this fashion. But where one cannot directly observe them, one finds that illustrations, since they show form and appearance, are better than maps for studying the individual units, though maps best express the distribution of the units. For this reason, portfolios of illustrations from the excellent pictures which appear daily, weekly, and monthly in the illustrated press, can be prepared to show the many differing aspects of the cultural landscape. (For fuller discussion see Chapter 4.)

In thus observing the facts of the cultural landscape we note that while they differ very much in shape, appearance, and distribution, it is possible to class them roughly under two main heads: those which are more or less fixed and those which are more or less movable or temporary. We have referred above to the anatomy and physiology of the cultural landscape. When we speak of its anatomy we have more or less in mind the structural elements of the landscape, and when we speak of its physiology we are thinking of its circulation, or movement, or activity. Thus houses and factories, fields, fences, footpaths, irrigation channels, embankments, etc., are what might be classified as structural, anatomical, or 'fixed' elements of the landscape (Fig. 3 and Plate 7). The word 'fixed' is used only in a relative sense, as is the term 'fixed' in connection with capital in the accountancy world. All these items wear out and disappear in time, but are relatively permanent. On the other hand, the elements which make up the physiology of the cultural landscape might be classed as relatively impermanent, or changeable, or temporary, or 'movable.' Such are piles of ore ready for shipment, growing crops in the field

(Plate 29), animals grazing (Plate 13), tractors (Plate 29), motor-trucks, trains, canal barges, ships (Plate 8), and last, but by no means least, man himself. This 'movable,' impermanent, or temporary group can be further subdivided into items which satisfy demand once, or are consumed at once in the satisfaction of a particular desire, and those which are used to satisfy demand many times. Of the first type raw materials such as growing crops or copper ore are good examples, while of the second, one of the best examples is a transport vehicle, or man. Bearing in mind the limitations of the words, we will for convenience use the terms 'fixed' and 'movable' to distinguish

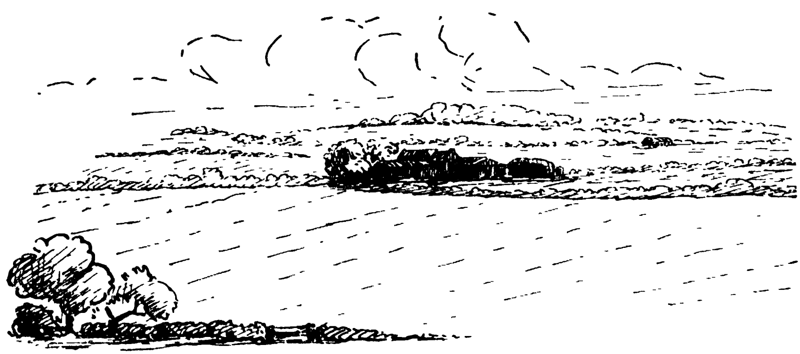

FIG. 3.—NORFOLK FARMSTEAD.

between the two main groups of elements—those which fall broadly under the head of the anatomy of the cultural landscape, and those which partake more of the nature of its physiology.

Under the head of the 'movable' group the elements dealing with the circulation or activity, and the output of the cultural landscape, other than those indicated above, should also be included. Such items as the crop production or mineral output of an area or region, the output of manufactured goods, the traffic movement, the exports and imports of a port, are all examples. These are only partly visible in the cultural landscape as we see it, as they are mostly in process of movement or consumption. The facts as to them are best obtained from statistical material, and should, as far as possible, be expressed in the form of maps or diagrams.

The items of the first main group, the 'fixed' group, are generally more intimately connected with the environment than those of the second group. Environment plays a greater part in determining whether land shall be used for cultivation or grazing or for a railway line than it does in determining the kind of crop, or livestock, or the type of rolling stock. Railway rolling stock throughout England is more or less similar, but the details of the lines, the tunnels and cuttings and embankments, the positions of stations and signal-boxes, vary markedly with the environmental complex. It is not, of course, suggested that the physical setting has little effect on the kind of crop grown or the livestock kept, but merely that its influence is greater in determining the fact of cultivation or grazing than that of oats or wheat or sheep or cattle as the temporary elements of the landscape.

While it is possible to classify the elements of the cultural landscape into individual elements, as in the case of houses and barns, fences and fields, it is also possible and useful to classify into very distinctive compound elements or units such as farms, plantations, oilfields, mining communities, manufacturing units, etc., each one of which presents a very distinctive cultural landscape an examination of which as a whole is essential to a study of a region. Such a unit as a farm is made up of an aggregation of a number of individual elements, the farmhouse or living shelter, the barns or store shelters for grain, roots, animals, or tools, the fields of growing crops or animals, the orchard and garden, the fowl-house, the well or windmill or other pumping plant for water supply, the fences, hedges, and farm roads, the patch of woodland for fuel or shelter for the house (Plate 14). These, among others, combine to produce that distinctive unit of the cultural landscape which we call a farm. It constitutes the concrete expression of man's adaptation of nature in the effort to satisfy his demand for commodities produced indirectly from the land, or if one prefers the phrase, to wrest a living from the land in a particular way or ways.

Such units as farms are found widely spread as definite units

of the cultural landscape nearly all over the world, but they vary much in size, in shape, in appearance, in the kind of activity carried on, and in the nature of the organisation of the individual unit. Hence, while the unit is quite definite and capable of being clearly defined, the details of the individual units vary much in response, in the main, to the nature of the activity and the character of the environment. Thus ranching, livestock farming, grain farming, mixed farming, dairying, market gardening, and fruit-growing, produce each a distinctive cultural landscape varying with differing physical settings. In each case such a cultural landscape is made up of a series of units of which the farm or farm holding, whatever it may be called, is in most countries the type.

Let us examine the cultural landscape more fully, with a view to seeing how far it is possible to classify it. Later we will discuss methods of observing and recording it.

In seeking for a principle on which to base our further classification we observe that since the units of the cultural landscape express the relationship between human activity and the physical setting, we can take as our guide either the character of the activity or the nature of the natural environment. Since our controlling viewpoint lays the emphasis on the side of man rather than nature, so our classification should do likewise. Since human activity takes place primarily in response not to environment but to demand for satisfaction of definite human desires, we can usefully take as our primary guide in classification the nature of those needs; and as a secondary guide we can take the character of the environmental complex. Since we need to arrange our classification in an orderly fashion, we might proceed by selecting first those forms of the cultural landscape which are an expression of man's adaptation of nature in satisfying his most urgent needs [4]. We find, however, that while the most urgent need is to satisfy the demand for food, the element which represents an adaptation of nature to meet the need for shelter is a more universal fact, and one therefore which forms a better individual geographical index of the distribution of man, the motivating feature of the cultural

landscape. Since man is the source of all demand, we could best begin the study of a region with the distribution of man, but since he is a 'movable' element of the landscape, his shelters form a convenient index of his distribution—one which is probably, in spite of its many limitations, a more accurate index than any other we have available (see Chapter 7).

While all communities must eat, all communities are not engaged, except indirectly through the production of some surplus having an exchange value, in satisfying the demand for food. Hence those units of the cultural landscape which express in concrete fashion man's effort to satisfy this need, are present only where the community is primarily or mainly engaged in satisfying directly this need, as in the case of fields of growing crops or livestock. On the other hand, a prominent and universal element of the cultural landscape in every region is the dwelling in which man lives, or the shelter in which he works or stores his products, implements, or machines. In studying the cultural landscape we may perhaps be justified in considering this element first because of its more universal character.

As the shelter erected by man is primarily connected with three needs; the need for a shelter in which to live, to eat, and to sleep, or a domestic shelter; the need for a shelter in which to work; and the need for one in which to store things, we can usefully classify it, in the first instance, under these three main heads. The dwelling, from the simplest hut to the king's palace, the hotel, flat, apartment house, and lodging-house, are all examples of the first type. Each one of these might be described as a 'fixed' objective expression of man's adaptation of nature in the effort to satisfy the desire for a dwelling-place, using the phrase dwelling-place in the sense of a place in which to live as distinct from a place in which to work. A Norfolk farmhouse (Fig. 3) is as effectively described and classified by the above phrase from the geographic standpoint, as is the house of a prosperous merchant in Stoneygate, Leicester, or Number 25 Miners' Row in a northern coal-mining town. It is clear that since each of these dwellings in size, appearance,

location, material of which it is constructed, etc., differ, subdivision is needed. While much detailed study remains to be done before a completely satisfactory classification of even this one item of the cultural landscape can be made, nevertheless the lines along which such classification may tentatively proceed may be suggested.

Our best guide is here again to be found in a twofold consideration. The differences observed above are due, in the main, on the one hand to the kind of activity the householder is engaged in, his financial resources and tastes, and the time period at which and during which the adaptation of nature has been going on. On the other hand, they are due to the environmental conditions of the region in which the house is situated. In the former case we could perhaps usefully further subdivide under the head of form and appearance and general layout as against the function which the dwelling performs in housing people engaged in differing activities, although the two elements here will be found to be closely related. Environmental conditions chiefly show themselves, on the one hand, in connection with the materials of which the house is composed and its general form and shape, and on the other, in the location of individual houses, or the massing of houses as in villages, towns, and cities. Thus in the south of England and in the clay lowlands of the Midlands, houses are mostly built of brick, in the Cotswolds and in the 'Cliff' region of Lincolnshire, of stone, in the great forest regions of wood or skins (Plates 1 and 2), in hot, relatively rainless and treeless regions of adobe [3], and on the shores of the Arctic of skins in summer and snow blocks in winter [2]. The differing materials used represent differing responses to environmental conditions in satisfying the need for shelter.

Man is a social being. The aggregation of the shelter units into villages, towns, and cities is a concrete expression of this. This massing and the characteristic appearance of the villages varies from region to region, and is a function of the activity carried on, the natural environment, and the time-period and traditions of the people. Thus in western pastoral England

the villages are small and scattered, in the agricultural east they are large, compact, and numerous as in Cambridgeshire, with few houses in the intervening areas. These can be further subdivided on a basis of the degree of compactness. Other village types are the linear villages (Chapter 7), due chiefly to natural or artificial restrictions such as roads or valleys. Many of the differences are due to the historical conditions under which settlement took place, they being in turn influenced by the physical setting. Any such village, for example the village of Helidon in Northamptonshire (Chapter 9), may be described in terms of the cultural landscape as the concrete or objective expression of man's adaptation of nature in the effort to satisfy the desire for shelter and a community centre for rural workers.

In such a village we find small shops in which people work during the day. In larger villages and in towns and cities we find workshops where cycle and motor repairs are executed, factories in which many articles are made, offices where clerical work is carried on, schools and colleges in which instruction is given. All of these are work shelters—places where work can be carried on under cover. The advantage of these shelters lies in the greater ease with which many kinds of work can be carried on under cover. Workers can be massed more effectively on a given area where a factory consists of a series of floors one above the other. The influence of the physical habitat is here most marked in connection with climate. Work can be carried on in greater comfort with less likelihood of the material being spoiled through cold, heat, or moisture. Work is carried on in greatest ease and comfort when it is possible to eliminate the effects of varying temperature, humidity, and precipitation. This can only be done with any degree of effectiveness under cover. A factory or steel works (Plate 7) expressed in terms of the cultural landscape, is the 'fixed' concrete expression of man's adaptation of nature in the effort to satisfy the desire for some article produced by a manufacturing process.

The third form of shelter is found in town, city, or the countryside. In the city the warehouse for storing raw

materials and finished goods, the yard and shed for coal and timber, in the country the barn for hay and grain, are all examples of the storage shelter, the third form of shelter which man erects. Any one of these expressed in terms of the cultural landscape is the 'fixed' concrete expression of man's adaptation of nature in the effort to satisfy the demand for storage facilities.

These shelter elements are an indication of the presence of man. He is the chief 'movable' element of the cultural landscape, both the motivating force obeying the urge to satisfy his desires and the chief controlling and active agent in it. Without his activity it becomes dead and useless. His constant care in the fields, ploughing, seeding, and harvesting; on the farms, tending and cultivating; in the mines and quarries, winning raw material from the ground; in the factories, shaping raw products into consumable articles; in the villages, towns, and cities, trading, governing, and engaging in social activities—maintains, renews, and preserves the elements, units, and features of the cultural landscape. He is movable, temporary, shifting from spot to spot, but none the less the major essential element of the landscape itself. Whether steadily at work in the fields and factories, or temporarily engaged in crossing the White Pass in the Yukon gold rush of 1898, dying on the way, or among a group of Red Shirts at a revolutionary meeting at a convenient nodal point on the North-West Frontier, or having a round of golf on a sandy links with a friend, he is still an element of the cultural landscape—an element without which, sooner or later that landscape would decay and disappear, overwhelmed by "the licentiousness of nature."[1]

We have seen that while the shelter in which man lives and works and stores things is a universal 'fixed' element of the cultural landscape, the most urgent demand is for food. As food may be regarded in the first instance as a raw material, we may now usefully consider those elements of the cultural landscape which represent man's adaptation of nature in the

[1] Gibbon.

effort to satisfy the demand for raw material, whether that be for food, or clothing, or some other product. Raw materials on a basis of origin may be classed broadly under three main heads—those produced directly from the earth as in the case of salt or iron; those produced indirectly from the earth through the agency of vegetation as in the case of wheat or cotton; those produced indirectly from the earth through the agency of vegetation and animal life as in the case of meat and wool. Each of these groups of activities produces a highly specialised cultural landscape.

Since the shelter either to live, work, or store things in, is such a universal element, we generally find it wherever there are human beings, but we find it taking certain specialised forms according to the character of the activity and also the environment. These might be considered as primary fixed elements. We also find other specialised elements which vary with the activity and the environmental complex. In the case of commodities produced directly from the earth we have such highly specialised forms as colliery overhead winding gear, spoil heaps, oil storage tanks, the derricks of an oilfield. Where the materials are produced indirectly from the earth through the agency of vegetation or animal life, we find in addition to the shelter elements, such common elements as fields, fences, footpaths, farm roads, stiles, and all such other modifications of nature as result from what we generally call farming operations. In addition, where farming operations are highly specialised, as in the case of irrigation or market gardening, we have other specialised forms. Irrigation channels and ditches, gear for controlling the water flow, embankments to retain the water on the cultivated land, glasshouses for the cultivation of tomatoes, among others, may serve as examples. All these might usefully be classed as secondary fixed elements.

The degree of adaptation of the natural landscape varies with the differing activities and environments. Such an activity as ranching only slightly affects the environmental complex. Carried on usually on a large scale, the ranch house, with its accompanying shelter buildings, is situated far apart

from any other unit, and the open range where the animals graze is little changed from its natural condition. Nomadism developed in a similar environment in which even the shelter elements were impermanent or movable features of the landscape, and moved with the flocks and herds as they were driven from one area to another, as the grass in a particular area became used up. Man first obtained the bulk of his requirements from nature through the agency of animal life which provided him with food, clothing, and shelter. With the utilisation of vegetable life of a kind superior to wild berries and nuts, and the consequent need for cultivation, the necessity for subdivisions of the land led to the erection of fences and walls and the ploughing of the land—all of which represented a definite adaptation of the face of the ground and the development of a clearly defined cultural landscape. With livestock farming as distinct from ranching or herding, enclosed fields and pasture lands and the care of pastures, also led to the modification or adaptation of the physical setting, and the need for winter feed for animals led to the growing of roots and other animal food crops which produced further modifications. Our typical livestock farm, in addition to the farmhouse, has enclosed pastures, fields for roots and grain, barns for storing winter feed, perhaps a silo, and winter shelters for the livestock. In specialised grain farming, the fields or enclosures are very large; they are mostly occupied by one crop, for example wheat; the farm buildings are also large; the burning straw piles after harvest are in some areas a characteristic temporary element of the landscape; and the whole scale of things approaches ranching or even mass production rather than livestock farming.

One could hardly picture a greater contrast to any of the above than is shown in the landscape of fruit farming or bulb farming. The buildings are small, the enclosures are also small, intensively cultivated and occupied by crops. In the case of fruit farming, there are commonly two crops on the ground at the same time, fruit trees such as plums in long, regular rows, and underneath or closely interspersed small bush

fruit, possibly raspberries or gooseberries, or even strawberries (Plate 3). In the most intensive type of such land occupancy, the Arab date garden, there are three tiers of utilisation. On the ground are vegetables and small fruits, then fruit trees of the apricot type, and lastly, towering above all, with, as the Arabs say, its feet in water and its head in fire, is the stately date palm, the fruit of which is the mainstay of Arab economy (Chapter 10).

In the typical dairy country rich pastures, silos, farm buildings, livestock shelters, creameries, and cheese factories are the commoner elements of the landscape, but the principal unit is again the farm or farmstead, each one of which possesses all of these elements with the exception of the cheese factories and creameries, which represent an introduction of the ideas of manufacturing industry into the countryside, and as such form distinctive units, which none the less help to mark off certain parts of the typical dairy country from other farming areas.

A still more highly specialised type of cultural landscape is found in regions where the natural rainfall is inadequate. Man is then forced to bring a supply of water from districts where it is in relative abundance. The extent to which he can do this depends on the physical setting in relation to the additional cost thus incurred and its effect on the final price of the commodity produced. Under this head come all types of activity which depend on irrigation. The remarkable terraced ricefields of the Philippines or Japan, the wheatlands of the Punjab, the cotton fields of Egypt, illustrate this type of cultural landscape. The fields are usually divided up into small plots easily flooded and easily controllable. The numerous water channels, water control gear, embankments, and flooded patches form the typical elements of the landscape apart from the shelters. Where, as in the Philippines, the hillsides have to be steeply terraced to get sufficient areas of flat land for cultivation, the landscape with steep walls, its narrow ribbons of water, and its general step- and stair-like appearance, becomes even more remarkable, and forms a

striking example of how man can rise above nature's limitations when the necessity arises.

A somewhat similar type of landscape superficially results where drainage operations have been necessary to make land cultivable, as in the polders of Holland, the fens of Cambridgeshire, the moors of Hanover, and the freshwater marshes of Norfolk (Plate 44). While there is a general similarity, in each of these cases there are striking differences in detail due to the differing environmental and historical conditions and the mode of land utilisation, e.g. the windmills of Holland and the high, level roads of the Fens.

Apart from irrigation, we have not as yet laid much stress on climate as a factor producing changes in the cultural landscape. A brief consideration shows that marked changes are due to its influence, which in the main operates in producing changes in the movable elements of the landscape. It is climate chiefly which delimits the production of cotton in the south-eastern parts of the United States. It is climate which gives us rye in northern Russia and wheat in southern Russia, and it is climate which to a large extent determines the character of man himself. Man, we have seen, is a movable item in the cultural landscape, just as are livestock and growing crops. Some might contend that man is part of the natural landscape, but from one point of view so are waterways, grass, and crops. Man has modified these elements to fulfil his needs, and he has himself been modified both in characteristics and distribution. The negro labourer picking cotton in the cotton fields, the Japanese coolies with their primitive waterwheels raising water to the rice patches, the Tamils planting rice seedlings in water, are all as much part of the cultural landscape as the buffaloes and primitive ploughs of Ceylon at work in the flooded fields, and the grain itself waving in the wind. The differences observed in these elements of the cultural landscape are in the main due to climatic conditions.

Just as nomadism produced little change in the natural landscape, so the simple gathering of forest produce practised by primitive tribes, produces a cultural landscape only slightly

more defined. The gathering of rubber and palm oil, and the hunting of animals give rise to a landscape in which the shelter elements are the only ones that are at all marked, with the exception, perhaps, of primitive trails through the dense growth especially of tropical and subtropical forests. Hunting, as a regular method of getting raw materials from the ground through the agency of animal life, gave place to the domestication of livestock and the consequent development of the cultural landscape connected therewith. The gathering of vegetable forest products has given place in certain areas either to intensive native cultivation, as in the case of cocoa-growing on the Gold Coast with its striking cultural landscape, consisting for the most part of definite units in a way comparable to farms, or to the development of plantation industry, as in the case of tea and rubber and sugar cane with their large shelter units or compounds for labour, the overseer's house, the storage sheds, the sheds for treatment of the product, the large enclosures in which the product is grown, and the network of communications linking the different parts of what, in the last analysis, is an application of the principles of large-scale manufacturing industry to a branch of agricultural enterprise.

Some of the landscapes thus produced vary very much in the layout of the crop, and develop remarkable appearances. The tobacco-growing industry of Florida is one of these. Here, in order to produce a high-grade leaf tobacco by shading the plant from the sun's rays, the tobacco is grown under immense cotton shades erected on poles, the landscape from above having the appearance of immense whitewashed stretches of country with darker bands formed by the roads and passage-ways in between. Equally striking, in a different way, is the landscape of pineapple cultivation in the Hawaiian Islands, where the young pineapples are planted in holes cut in strips of paper to prevent the rapid growth of weeds, which in the early stages of the young plant's life would smother it unless an excessive amount of careful cultivation was carried out.

Wherever products are indirectly obtained from the earth's crust, either through the agency of vegetable or animal life,

the units of the landscape produced through the process of exploitation are made up of simpler units which are in their main essentials the same. The most prominent of these are the shelter units. They are, as we have seen, threefold—the shelters in which those engaged in directing and carrying on the work live, those in which the implements employed are kept or the products are stored, and lastly those in which a certain proportion of the activity of the unit is carried on. In addition to these, which, as we have suggested, might be regarded as primary 'fixed' elements, there are a whole group of secondary 'fixed' elements, including the enclosures with the necessary boundary or limiting features within which the products are raised or kept. Fences, walls, hedges, gates, and stiles are boundary features. In addition, paths and field roads and drainage channels and ditches are common. Further, we have in such a unit, all the necessary 'movable' elements of the landscape—the growing crops, the livestock, the farm vehicles, implements, tractors, etc., and of course man himself.

Further elements may be present, such as silos in dairy farming, depending on the nature of the activity, or windmills for pumping water on the 'Cliff' country of Lincolnshire, or the prairies of North America, or for drainage purposes as in Holland, or formerly in the Fens. In this latter case the time-period element chiefly comes into play in determining the difference between the tall, spidery, steel structures of Lincolnshire and the solid, compact, relatively low-built structure of the Dutch windmill.

In all cases where the material is obtained indirectly from the earth's crust through the agency of plants and animals the essential unit is the organisation unit. The ranch, the dairy farm, the grain farm, the market garden, the irrigation holding, the plantation, while not necessarily ideal organisation units for production, are those which have so far evolved in relation to the time-period element, as the most efficient in practice. Future developments indicated are growth, possibly in size, and an increasing amalgamation of these units to form larger organisations without, however, destroying, or,

perhaps, even materially altering the units themselves. Whatever the future may have in store, there is little doubt as to the nature of the units to-day, and we shall see when we consider other methods of production and manufacture, that the organisation unit is the essential unit that gives character to the cultural landscape, such unit being of course materially modified by the environmental complex and the time-period element.

We see, then, that the cultural landscape in so far as we have examined it, appears to be the expression of three things, namely, (1) human activity as organised for the production of commodities for the satisfaction of human wants; (2) the natural environmental complex which man adapts and modifies in the above processes, and which itself modifies and adapts the character and type of the activity; and (3) the time-period during which the adaptation process has been going on. This latter factor involves the actual length of time during which the process has been going on, the stage of civilisation or development reached by the community concerned, and the degree to which the resources of human knowledge can be economically applied to the area concerned.

If at this point we summarise our tentative system of classification of the elements of the cultural landscape produced by the effort to satisfy the desire for materials either for food or other articles obtained indirectly from the earth through the agency of plants or animals, we see that the elements of the landscape can be classified either as 'fixed' or 'movable,' that they may be divided into primary and secondary elements, that these combine further to form organisation units which are characteristic in each area. These organisation units vary with the type of activity, the environmental complex, and the time-period factor. The chief types of activity causing variation in the units are ranching, livestock farming, grain farming, dairy farming, mixed farming, fruit-growing, market gardening, irrigated production, plantation production, and native holdings. Over all of these activities soil, slope, structure, precipitation, temperature, and other elements

of the environmental complex, exercise a potent influence. Coupled with them is the time-period factor which modifies the character and appearance of the elements and units of the cultural landscape to the degree mainly to which the state of human knowledge and civilisation is applied to them.

We may, perhaps, in concluding this chapter, usefully describe in terms of the cultural landscape, a very simple piece of country with which many are familiar. If we take up our stand in the southern part of the Weald on a piece of rising ground near one of the rivers running southward to the Channel through a gap in the chalk Downs, we see at our feet the river flood-plain forming rich meadowland in which cattle are grazing. These cattle and the enclosures defined by hedges, in which they are found, represent respectively ' movable ' and ' fixed ' objective expressions of man's adaptations of nature in the effort to satisfy the desire for a particular kind of food. As they are beef cattle, the demand satisfied is for meat. In the background, sloping down to one side of the gap, the Downs are a suitable environmental setting for sheep herding, which represents the objective expression of man's adaptation of nature in the effort to satisfy the demand for clothing and food through providing the far-famed Southdown mutton and wool. Nearby on the river bank a piece of flood-control gear emphasises the wet character of the lowland, making it unsuitable for sheep but not for cattle. In the middle distance a farmstead with farmhouse and accessory buildings forms the core of the organisation unit which exists to organise the production of the raw materials mentioned above. The farmstead is thus the central feature of the objective expression of man's adaptation of nature at this particular place to satisfy the human demand for certain forms of food and clothing, namely, beef, mutton, and wool (Plate 3). It will be clear from the above that every element or unit of the cultural landscape, whether simple or compound, can be described in terms of the following formula. It is a fixed/movable objective expression of man's adaptation of nature in the effort to satisfy the human

desire for . . . The degree of precision with which the formula describes the item depends on the nature of the words inserted, but the essential framework of every description is the same.

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Chapter 3

ANALYSIS OF THE CULTURAL LANDSCAPE (*continued*)

The cultural landscapes produced by the processes which obtain raw material directly from the earth: the cultural landscapes of power production, settlement, manufacturing industry, exchange, transport, municipal activities, central government, recreation, and the gratification of the æsthetic senses. The changing cultural landscapes of the past.

If we fly northward from London over the face of the countryside we see that it is not wholly devoted to agriculture. Here and there on the outskirts of the city are industrial plants set amid cultivation. Many villages and market towns lie below us. Reaching the Midlands we have below us a vast agglomeration of towns with factories and furnaces belching forth black smoke the poisonous fumes in which blight the vegetation. Flying low, we see a stream of men and women in what look like serried ranks issuing from the yard of a motor factory, for it has just gone 5.30 p.m. and the day's work is over. Near the factory are line upon line of small houses in regular rows which from the air form an interesting geometrical pattern. To them the workers are returning for their evening meal. A little later we might see them in queues waiting to enter a picture-house.

On the outskirts of the cities are many tall erections, the winding gears of collieries (Plate 4), which supply the fuel for the factories. The parts of the whole we have seen are linked by an intricate network of roads, rails, and some canals. If we were over South Wales, we would see these collieries, houses, factories, and works concentrated in narrow steep-sided valleys with wide spaces of high moors in between (Fig. 8). Were we over Oklahoma in Middle Western America we would see a forest of tall derricks, many circular

and oval buildings, and flying low would get the strong smell and probably a spray of crude oil. We are over a part of the mid-continental oilfield.

Flying north-east, near Leicester we see an enormous pit scarring the face of the earth. In it men have been engaged all day extracting stone for building purposes and road dressing. A short spur line links it to the main railway. In a nearby village are the rows of quarrymen's houses.

All these things we have seen from the air are some of the elements of the cultural landscape resulting from man's efforts

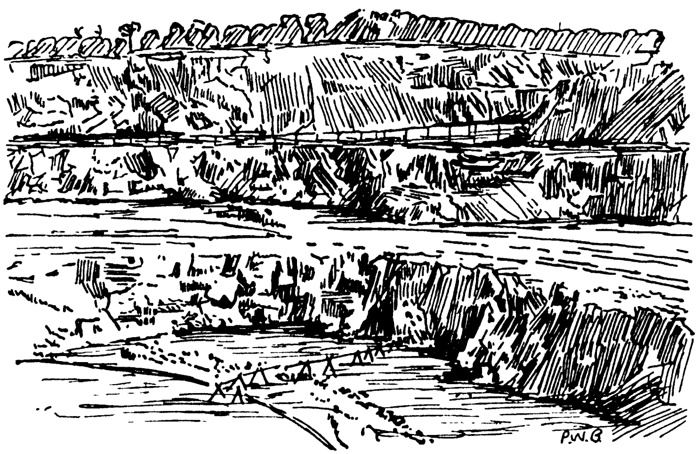

FIG. 4.—BARDON QUARRY, LEICESTERSHIRE.

to win directly from the earth materials to satisfy his need for commodities and power. Let us see how far it is possible to analyse and classify them. The activities which produce them are sometimes loosely classed under the twin heads of mining and quarrying. They produce landscapes which can be briefly and conveniently considered as falling under four main heads or into four main groups. We are thinking of raw materials which are raw materials in the sense of material taken and converted into usable commodities, and not such materials as are used for the production of power. These four groups are : (1) landscapes caused by the opening of great pits or holes in the ground in level areas or in hillsides ; (2) those which are

the result of the cutting away or washing away of hillsides; (3) those found where the minerals or products lie well below the surface and are in comparatively narrow veins or zones; and (4) those produced where, in addition to winning the material, it is treated in some way on the spot before shipping elsewhere. This latter group may be found in connection with any of the above.

Of the first group the quarrying of road metal from the igneous rock of Bardon Hill in Leicestershire (Fig. 4), and the winning of iron ore in the great open pits of the Mesabi Range in the Lake Superior District, are excellent examples. In the first of these, the semicircular amphitheatres in the hillside, the miniature lines of rail for conveying the material to the main line, the piping on stilts which carries the compressed air to the drills working at the rock face, the shelters from the blasting, the heaps of loose rock, the railway trucks into which the material is loaded, the small conveyor trucks, the men working high up on the rock face, the rows of quarrymen's houses, and the offices of the operating company are all elements of the cultural landscape. The quarry with its related elements is an organisation unit, the expression of man's adaptation of nature in the effort to satisfy the demand for road metal derived from the excellent igneous rock material available in Leicestershire. In this landscape we see again the shelters for living in, working in, and storing things in, and also the specialised elements due to the nature of the material being worked, the mode of working, and the physical setting.

The hydraulic mining of tin in the Malay Peninsula is a good example of the second type. The landscape produced is very similar to that we have described, the workings being exposed on the surface, but the whole presents a rather different appearance. Characteristic elements are the great pipes carrying the hydraulic jets for operating on the material containing the ore. Closely related to one or other of the above are such workings as the tin workings of Bolivia, where operations are being carried on on spoil heaps left from early workings of the third group.

Where the materials to be worked are deep below the surface, and/or in narrow veins or seams, shafts have to be sunk, or adits driven into hillsides to reach the ore. The actual working of the material is not then visible on the surface. The mouth of the opening only is visible and this in many cases is covered by the apparatus erected to haul the material won below to the surface, or to lower materials and labour to the levels below. Such a cultural landscape is not so striking in appearance as those we have mentioned above. It does not cover so large an area. On the surface there are the usual shelters for workers and administration, the winding equipment and other specialised plant, and the spoil heaps made up of the rejected material. Excellent examples are the zinc workings of Ontario (Plate 5), the silver mines of Mexico, the tin workings of Cornwall, and the iron ore of the Penokee-Gogebic. Since iron and tin working both fall into two groups, it would be difficult to classify them satisfactorily on the basis of the commodity produced.

A characteristic feature of these cultural landscapes is that the organisation units tend to occur in more or less isolated instances corresponding to the location of the deposits, and are not more or less evenly spread over the surface as in the case of farming and related activities. This is also true of the fourth group, the landscape of which is present where there is some kind of plant for the preparation of the ore (Plate 4). The Bardon Hill quarry could also be classed under this group, as the crushing plant for the road metal is on the quarry premises. The elaborate cyanide plants of the Witwatersrand, the reducing plants of many copper-producing units, are in the same class. It would perhaps be better to consider such units merely as modifications of the first three groups. Sometimes the reducing plant is alongside the mine or quarry, but sometimes, and here the dominant factor is usually, but not necessarily, the physical setting, the plant may be some distance away. The mining centre of Rossland in British Columbia and its companion smelter at Trail are good examples of this relationship.

The organisation units of the above groups tend to be more or less isolated. In the landscapes produced in the effort to satisfy the demand for power in the form of coal and oil, the organisation units are usually found in great numbers in any given area. They therefore resemble in this way farming units rather than those above. In a coalfield the individual units are made up of store shelters, dwellings, offices, winding equipment, and are like those of group (3) above. In any coalfield there are usually a great number of points where mining can be carried on owing to the extent of the area occupied by the seam. There are a great number of organisation units or individual mines. There is a tendency for the miners to live in large villages which may house men working at a number of different mines. Such a region as South Wales is fairly typical. In it the cultural landscape, owing to the number of mines and villages concentrated in the narrow valleys, is very striking and markedly different from anything examined above (Chapter 7). The number, shape, and arrangement of the mining villages, the numerous colliery overhead winding gears, the spoil heaps, the railway lines and roads, all crushed into the long, narrow valleys with the widespreading uninhabited moorlands in between the valleys, produce a very remarkable cultural landscape, giving rise to many of the sociological problems of the South Wales district, and intimately related to the physical setting, and the demand for a particular kind of coal.

Turning to oil production, we find a still more striking but less widely spread cultural landscape. Since oil occurs in much more limited patches than coal, an oilfield covers a smaller area, but one which nevertheless is sufficiently large to enable a great number of bore holes to be drilled, each one of which is surmounted by an elaborate derrick with associated buildings. An oilfield thus presents the appearance of a forest of derricks which may with great rapidity appear in any kind of setting, tropical forest, desert, ocean fringe, agricultural land, or even city streets as in Oklahoma to-day. Owing to its fluid character, the problem of storing oil is much more difficult than that of storing coal. The rapidity with which it comes to,

or may have to be brought to, the surface in cases of offsetting to avoid its loss to some other holder accentuates this difficulty. Thus the great storage tanks, both circular and oval, are elements of the cultural landscape of most oilfields. The working force required to handle oil being much smaller, the domestic buildings needed in an oilfield are not so numerous in proportion to area as those of a coalfield. Further, the landscape itself is not so permanent owing to the relatively short life of an oilfield and the absence in connection with it of manufacturing plants. Associated with some oilfields there are, however, refineries, at which a certain amount of refining is carried out before shipping the product elsewhere for final treatment. These refineries are to oilfields what smelters are to mining areas. The great pipe-lines linking the region to a port or central distributing area are usually striking features, and at the ports the oil-tankers form distinctive elements of the cultural landscape.

The organisation entities of hydro-electric power development are usually found in separate units. At Niagara and one or two other water-power centres, there may be several power stations operating from one fall, but these are usually found within a comparatively small area. Hence the distribution of the plants resembles the case of isolated mining areas. To produce power from water, pressure is needed. A high fall or a great volume of water, or both as at Niagara, is required (Plate 19). Water-power units can therefore be usefully classified on the basis of whether the pressure is obtained from a natural fall or an artificial one, and on whether chief reliance has to be placed on height or volume for pressure. This gives us two main groups—the natural falls with certain subdivisions, and the artificial falls with certain subdivisions. In the first we have such great water-power centres as Niagara, Great Falls (Plate 5), or Seven Sisters Falls on the Winnipeg River, many American, Swiss, German, and Swedish centres, and the developments in Tasmania. While all of these centres rely on natural falls, we can usefully, from the standpoint of the cultural landscape, distinguish between centres such as Niagara

where the power station is placed at or near the foot of the falls, and those of Tasmania or the Rhone Valley where the water is brought a considerable distance and from a great height in pipe-lines, which form often striking features, to a power station situate at a much lower level.

Apart from the dwellings which house the workers, sometimes at the plant itself and sometimes in a nearby village, the main elements of the cultural landscape are the power-house which shelters the turbines and generating plant, the pipelines which convey the water to the plant, the transformers where the current is stepped up in voltage for transmission purposes, and the high-tension overhead transmission lines with their standards. Telegraph and telephonic lines are usually present for communication between the plant and the source of the water supply.

Where there is a sufficient supply of water coupled with conditions favourable for constructional work to provide an artificial head as at rapids or in a narrow river valley, we find plants of the second type. An artificial barrier or dam is thrown across a narrow valley, a lake is formed above, the power-house is built at or near the foot of the dam, the height of the dam produces the necessary head, and the volume is provided by the artificial lake. From the standpoint of the cultural landscape the chief difference here is the greater extent to which the natural landscape is altered through the flooding of the valley above and the erection of the dam (Plate 6).

If a suitable mountain valley is not available, a dam is thrown across a large river producing a lake-like expanse on the river above the dam, through the raising of the water-level thirty feet or so. A low fall results. Coupled with the large volume of water available this may be used to produce great power. Where done on a navigable river, a canal and locks are needed to handle the traffic. The Roosevelt dam in a mountain valley of Arizona is one of the largest examples of an artificial fall of the first type. The Keokuk plant on the Mississippi derives power from a low artificial fall. The

general appearance and the canal and connected works to care for river boats, distinguishes this plant from that of the mountain-valley type.

Power is commonly distributed by high-tension transmission lines from these units to nearby centres. Sometimes industries develop at the plant itself. The aluminium industry of the Falls of Foyers in Scotland and the metal-working industries at Niagara illustrate such growth. The cultural landscape at these points is thus more extensive than that to be found where such plants are not found. In addition to the extra plant there is the provision for more workers.

Somewhat similar changes occur in the natural landscape where water is needed for domestic or industrial supply. Great cities to-day, to cater for their growing needs, are forced to construct in hill-country, reservoirs, such as Lough Vrynwy in central Wales, which supplies Liverpool, or to deepen existing lakes, as was done by Manchester at Thirlmere in the Lake District, by the erection of dams and the necessary shelters for regulating the supply. On a very small scale we see the same change taking place when a textile manufacturer constructs a pond to feed his engines, or a miller barricades a river to supply his paddle-wheels with water.

The utilisation of the wind for power causes changes in the natural landscape. The windmill with its tower and quaint sails giving power for the grinding of corn or the pumping of water is a familiar feature in Holland, the Fens, and the Lincolnshire edge. Its modern, tall, spidery form tends to replace it for water supply in many districts. Here the presence of relatively steady winds, sometimes coupled with elevation, are the chief elements of the environmental complex determining its position.

Where a raw material or power is obtained directly from the earth the elements of the cultural landscape can be studied either in simple individual elements such as the dam or pithead gear, or in organisation units as the coal mine or the quarry, or the hydro-electric plant. The individual elements can also be classified either as 'fixed,' as is the stone-crushing plant, or

'movable,' as is the stone or the truck which carries it, or the man who handles it. Certain items come on the borderline between the two. We also see that the organisation units are in some cases isolated ; in others grouped together in large numbers.

A coal mine expressed in terms of the formula suggested for the cultural landscape is a concrete expression of man's adaptation of nature in the effort to satisfy the demand for a particular form of power. The water-power plant or the organisation unit of an oilfield is the concrete expression of man's adaptation of nature in the effort to satisfy the demand for water power and oil fuel respectively.

Isolated individual manufacturing establishments are somewhat analogous to water-power plants and smelters. They are becoming an increasing feature of the landscape in country districts, on or near main lines of railway running out of a large centre such as London. Such sites are partly in connection with local supplies of raw material, partly to take advantage of the lower taxation of rural areas, and partly are due to the development of modern means of communication, which tends to nullify some of the advantage of location in a large centre or on a coal field.

Few human wants are satisfied merely by the production of raw materials. Man takes raw materials like cotton, wool, iron ore, or copper, and through the application of labour, power, and capital converts them into commodities for human use. In the earlier stages of human development, this conversion was effected by hand labour, using very simple tools. The characteristic feature of modern industry is a large output per unit of effort. A higher standard of living has thus been obtained, in the sense of a greater quantity and variety of goods and services available for the individual. This larger production per unit is only possible through the application to industrial processes of machine tools driven by power. The economies effected by production on a large scale results in the concentration of great numbers of people in comparatively small areas. These areas produce large surpluses of com-

modities, the exchange of which leads to the complicated problems of transport and finance, and others which play a large part in the modern world.

Even in rural development we find concentration of people into settlements. The simplest forms of these are the villages. The village is primarily a home for the workers. They are usually employed at some activity outside the village such as farming or mining (see Chapter 9). The village is thus an essential unit of the cultural landscape, distinct from but closely related to the landscapes of farming, mining, power production, or other neighbouring activity. In it the life of, particularly the social life of, the surrounding district tends to concentrate. That fact tends to modify and mould it as a unit of the landscape.

Many attempts have been made to classify village types. A useful broad classification can be made on the basis of the shape of the village. The small scattered village of the western pasturelands of Britain is quite distinct in type from the compact agricultural villages of the east. These latter villages can be further classified on the basis of the degree of compactness. This depends in part on the twin factors of historical development and natural environment Two further definite village types are the linear villages caused by artificial or natural restrictions to compact development as at Naunton or Broadway, or to the influence of roads on their growth: and the double-village type such as Upper and Lower Catesby in the Midlands, or Upper and Lower Slaughter in the Cotswolds. These latter are due to simple expansion in relation to the local relief.

A further type is the highly specialised mining village, commonly linear in shape, to be found on the Newcastle coalfield (Fig. 23). Where factories develop near villages, as in parts of Leicestershire, the village becomes overgrown so much as to resemble a small town, though it still retains its village characteristic of housing numbers of people whose primary business is to work not in the village itself, but in the surrounding countryside.

The village is a definite unit of the cultural landscape characterised in the main by its shape, which is a function of the activity carried on in the neighbourhood, the natural environment, and the time-period factor including the historical traditions and growth of the people. It is distinguished from the town, not merely in size, but because the bulk of the activity of the villager takes place outside of the village, whereas that of the townsman is mostly in the town. Purely residential towns, such as Helensburgh on the Clyde, are partial exceptions to this view. The village regarded as a unit of the cultural landscape can be defined as a concrete expression of man's adaptation of nature in the effort to satisfy his material and spiritual needs by providing a community centre for workers in the adjacent countryside. In some countries it fulfils this function much more effectively than in others. Thus community feeling and spirit have developed to a much greater degree in the Welsh countryside than in that of most parts of England.

The town or city as distinct from the village is a centre in which people both work and sleep. Apart from being centres capable of easy defence, a characteristic which village settlements often shared with them, the town developed for market purposes at convenient nodal points, as a centre where hand industry could be carried on under the Guilds, as an adminisstration point, or a religious centre. With the application of machine power to the fashioning of raw materials, the demand for centres in which large numbers of people could live and work and store things, became more pressing. Towns then grew in size and many changed markedly in character and appearance. As machine industry enabled a much larger output per individual and a higher standard of living, the need for these centres with the growth of population became more urgent. A town or city as pictured above, can be defined as a concrete expression of man's adaptation of nature in satisfying the demand for a community centre in which very large numbers of people can work and store things and live a community life in a comparatively small area.

The characteristic appearance of a town or city as a feature of the cultural landscape appears to depend on five main factors. These are: (1) the layout of the city, (2) the buildings of which it is composed, their nature, and the material used, (3) the type of activity carried on, (4) the number of people in the city, (5) their tastes, and the extent to which a civic sense as expressed in the love for open spaces and beautiful buildings for æsthetic and health reasons has developed. Closely linked to this latter point is the degree to which it has been possible to give expression to this sense.

The first two of these are probably of maximum importance in determining the characteristic appearance of the settlement. The layout, by which is meant the disposition of the streets and open spaces and the general shape, is largely governed by the *raison d'être* of the place in relation to its topographical situation, together with the time-period element in its genesis and growth. Thus the narrow twisted streets, cramped area, and typical appearance of a centre like Chester, reflects clearly its historical growth in relation to the reason for its being and its physical setting, while the rectangular layout of a middle western American city reflects the flat prairie environment, the spaciousness of the physical setting, and the rapid modern growth which enables a city to be planned and developed within a comparatively short period.

The nature of the buildings and the materials of which they are composed vary with the nature of the activity, the materials available, the nature of the site, the climate, the presence or absence of destructive natural phenomena such as earthquakes or volcanoes, the degree of civilisation attained by the inhabitants, the extent to which old buildings from an earlier stage in its growth have survived, and the wealth of the citizens. This latter depends largely, but not wholly, on the nature of the activity carried on, and a number of other minor factors. Thus the wooden cities of western America reflect in part the absence of stone and the pioneering tradition of wooden buildings. They are now giving way to concrete constructions. The wooden cities of Japan express the liability

of the Japanese islands to destructive earthquake shocks and typhoons. The characteristic appearance of Stratford depends on the preservation of the half-timbered houses of Elizabethan England. They themselves were an expression of the materials most easily available in the locality. The appearance of Chipping Campden is an expression of the local stone together with the wealth derived from sheep farming, when England, instead of bringing her wool half across the world, was a great wool exporter. The flat-roofed mud buildings of North Africa, the skyscrapers of New York (Plate 34), the steep-to roofs of Montreal, the stone ' slates ' of the Cotswold villages, the brick factories of the English lowlands, the ' cathedral ' cities of these same lowlands, the stone-built tenements of Glasgow, may each be regarded as functions of the activity carried on, the physical setting, and the time-period during which human activity has been at work.

The appearance of a city will vary much with the kind of activity in which the citizens are engaged. Thus the steel works of Middlesbrough (Plate 7) and Gary, the rectangular cotton factories of the Lancashire cities (Plate 7), the shipbuilding slips of Ayrshire (Plate 8), and the mixed factories of a city like Leicester, each produce a marked effect on the general appearance of the city. The type of activity has also a marked effect on the characteristic ' atmosphere ' of the city. Leicester for a manufacturing city is exceptionally clean-looking, and immediately strikes the visitor in this sense. Apart from the developed civic sense of the inhabitants, the kind of industry carried on, chiefly the making of hosiery and boots, is of the lighter type which requires a relatively small consumption of coal for power in the city as compared with that consumed at a centre like Sheffield or Middlesbrough, where the industry is of a much heavier type.

The size of a city, and therefore the area covered, depends chiefly on the number of people in it, but in part on the physical setting and the housing habits and customs of the citizens. These latter depend in part on the physical setting. A city like Glasgow, where there is a strong tendency to live in flats,

does not cover as much ground in proportion to population, as one like Liverpool, where the individual house tends to be the rule. Still further is this exemplified in a city like Fort Worth where the tendency is, owing primarily to the great abundance of land and its relative cheapness, to sprawl over the face of the prairie, and therefore to cover an area which in proportion to population may be many times greater than that of an Old World city.

Owing to the multiplicity of variety possible, a satisfactory classification of the cultural landscapes produced by towns and cities is difficult. A tentative classification is here suggested which contains at least four major and a number of specialised minor groups. It is based chiefly on layout in relation to function and physical setting, and the time-period factor. Possibly further subdivision could usefully proceed along the lines of the characteristic appearance produced by the nature of the buildings and the materials of which they are composed.

1. The old-nodal point town type which has slowly evolved as a social centre, a market, exchange, administrative, or defence point. The characteristic feature of its landscape pattern is nodality. It is a centre from which many routes radiate, and at which they come to a focus within the settlement. It is subject to an infinity of modification according to its activities, its physical setting, and its historical development. Edinburgh, York, Chester, and Canterbury are examples.

2. The modern rectangular layout type of the recently developed centres as typified in most Canadian and American cities. Toronto, Rochester, and Chicago are types (Fig. 22).

3. The old nodal-point type which has grown in size and in parts changed its appearance by the addition of manufacturing districts. Leicester and Nottingham illustrate the change.

4. The addition of manufacturing to No. 2 changes its appearance and gives us a new group. The cities mentioned under No. 2 really come within this group. Few such cities to-day have not got a certain amount of manufacturing activity.

5. Coastal fishing towns such as Yarmouth or Lowestoft.

6. Seaside and residential resorts such as Brighton or Blackpool.

7. Large ports such as Liverpool (see Chapter 7).

Manufacturing towns can be further subdivided into those which occur as single entities, such as Nottingham or Leicester, and those which occur in related groups, such as the Yorkshire woollen group, the Lancashire cotton group, or the Tyneside group.

With the continued growth of manufacturing industry, towns and cities have been in the past, and to an even greater degree are likely to be in the future, extremely important features of the cultural landscape. They can be considered as compound units made up of a vast number of individual elements. The latter are chiefly the buildings for living in, working in, and storing things in. The characteristic appearance of the city depends largely upon the layout of these buildings in relation to one another. Much depends on the size and relative numerical proportions of the different kinds of shelter elements. As we have seen, the extent to which the normal rectangular block-like factory buildings with their tall chimneys are present, materially affects the appearance of the city. Such work units as blast furnaces which house a specific process still further alter the characteristic appearance. The grouping of the residential blocks, the placing of and character of the retail and wholesale sections, the office blocks and professional areas, the parks and other recreational units such as playing-fields, also affect the characteristic appearance.

On this question of appearance we need to note that every community carries on a main activity or group of activities which are special to itself or to others which make their living in the same way, and a series of subsidiary activities which it has in common with practically all other communities. The main group constitutes as it were the *raison d'être* of the city. It may be cotton spinning as at Bolton, or shipping coal as at Cardiff, boots and shoes as at Leicester, or metal working as at Birmingham. The minor activities are very numerous. Of these perhaps wholesaling, retailing, the provision of profes-

sional services such as those of the doctor, lawyer, accountant, and insurance agent, the provision of recreational facilities, such as tennis courts, football and cricket grounds, and the performance of municipal services, such as street cleaning, lighting, water supply, are perhaps outstanding. It is clear that while the distribution of the shelter and other elements connected with this minor group are of considerable effect in altering the characteristic appearance, the nature of the main activity or activities has much more effect on the appearance. This latter depends a good deal on the nature of the activity, because many different kinds of manufacturing industry of the factory type give rise to shelter units which do not materially differ in appearance and size.

It is clear, then, that any city gives rise to two chief groups of units of the cultural landscape—a variable group which to some extent depends on the nature of the activity carried on, and a non-variable group which is present in all community centres of a certain size, but which may vary in size and appearance to some minor degree. Special examples of the lesser group are the city parks and open spaces and the extent and character of the civic buildings. Some cities which have developed civic centres as has Cardiff at Cathays Park, present a very striking appearance which appeals to the æsthetic sense.

With the gathering together of large numbers of people into towns and cities arises the need for community activities of the type usually spoken of as municipal. They are concerned with the performance of certain essential services for the citizens as a whole, including the governing, policing, and cleansing of the city. In connection with each of these a specialised cultural landscape has developed, representing man's adaptation of nature to the need for these services. It includes city halls and police stations, destructor plants and water works. (See also Chapter 4.)

In addition to these services performed for civic communities, similar services are required on a larger scale for the nation as a whole. Thus our law courts, government buildings (Plate 9), naval and military establishments, training

camps and naval ports, have developed and form parts of the cultural landscape. The Houses of Parliament at Westminster (Plate 9) are the objective expression of man's adaptation of nature in satisfying the demand of the British Nation for a house of assembly in which the functions of the central governing body can be exercised[1]; the cadet establishment at West Point is the objective expression of the American people's adaptation of nature in the effort to satisfy the demand for a centre at which the selected youth of the nation can be trained for purposes of defence.

In the above analysis of the cultural landscapes of towns and cities no mention has been made of the transport services which link cities together. The effect of such services on the landscapes of towns and cities is mostly incidental to the terminal facilities needed for the handling of goods and passengers. We can perhaps usefully at this point survey in a general way the landscapes produced by man in adapting nature to his need for transportation facilities.

As the major governing factor in transportation is the need for moving men and goods between two places, the landscapes of transport can be roughly classified on the basis of the medium on, or through which the movement takes place—land, water, and air. Further useful subdivision is possible in terms of the vehicle used. On this basis land transport can be subdivided into transport by road and by rail, both of which show certain closely related features. Cuttings, embankments, bridges, and tunnels are common to both, though differing somewhat in character. The steel track provides a contrast. Its only road counterpart is where vehicles such as trams are used, which approximates to railway transport rather than road.

Water transport can be divided into sea and canal; a navigable river is perhaps best regarded as an extension of the sea into the land, and a canalised river as a type of canal, although there are many overlapping forms difficult to

[1] Note the immediate relationship to Nature. Building stone and other raw materials fashioned and set on a suitable site at the focal point of the Nation's life.

classify. Air transport can be readily subdivided on the basis of the vehicle used into transport by aeroplane and airship, the two systems presenting in some respects contrasting cultural landscapes.

The cultural landscape of each method of transportation is capable of a threefold subdivision under the heads of the way or track with its related gear and the effect of the environmental complex on it, the kind of vehicle used, and the terminals for handling passengers and goods at points where break of bulk is necessary. The characteristic forms of the terminals appear to depend chiefly on the way, the vehicle used, the environmental complex, and the state of historical development reached. The kind of vehicle is due to the nature of the physical setting, broadly whether land, water, or air, the nature of the service needed having regard to passengers, goods, mails, reliability, speed, expense, and the time-period factor in the sense of the extent to which the community is living under modern conditions, and taking advantage of improvements in mechanical design.

The convenience, partly of getting a sufficiently hard surface for regular use, and partly of finding one's way with ease, led to the making of paths, trackways, bridle roads, and ways of many different sorts, each one of which represents to a greater or lesser degree, a change in the natural landscape. The degree of change depends largely on the use to which the road is put, the width of the road, the materials of which it is constructed, and the extent to which the natural environment forces man to depart from the straight line and the plane surface between points. The dirt roads of the prairies, the gravel roads of Wisconsin, the concrete motor roads of England, the specialised wood block or rubber roads outside hospitals—each represent an adaptation of nature to the need for communication. Cuttings, embankments, and bridges represent an adaptation of nature to ease the gradient and to cross obstacles. The winding zigzag roads of the Philippines, the Alps, and the Adriatic coastlands (Plate 10), reflect the difficult relief conditions of those regions. Finger posts, Automobile

Association and other signs, traffic signals and control towers, are each specialised features of the cultural landscape of the road, developed in response to the increasing needs of traffic in relation to the environmental complex. The movable elements of the cultural landscape of the road vary with the period of development, the use to which the road is put, and the physical setting, from foot-passengers and carriers, pack animals and wheeled vehicles, to the fast cars and trucks, buses and motor coaches of to-day. The terminal facilities vary from inns and hotels to parking places and motor-coach garages.

The railway is perhaps best considered as a highly specialised road. Such is its origin. As a form of the cultural landscape its lines of steel tracks and its elaborate signalling systems throw it into sharp relief. The need for level crossings, or preferably bridges over or under roads, adds to its distinctive character, as do the long lines of vehicles, animals, and men which make up its movable features. Since a locomotive is more affected by grade than a road vehicle, the railway track is influenced to a greater extent by the environmental complex than is the ordinary road, hence the cuttings and embankments are more numerous, and the deviation from the straight line between points is more marked. This deviation is modified to some extent by the fact that cuttings and embankments are more likely to be profitable on railways than on roads. The crossing of spurs and ridges leads to extensive tunnelling on railways, a feature not so common on roads. As both the vehicle employed and the track are highly specialised, the need for transfer- or break-of-bulk points developed for the transfer of goods from rail to road vehicles. The passenger and goods stations and trackyards for handling and making up trains form striking units of the cultural landscape of transportation in towns and cities (Plate 30). The vehicular traffic on a railroad is denser than on a road owing to the expense of duplicating the track as compared with that of road construction. This also results in larger terminals.

If we examine a single element of the cultural landscape, such as a bridge, we observe how greatly it varies in response to the use to which it is put, the kind of vehicle using it, the nature of the material used to build it, the obstacle to be crossed, and the period of construction. The simple single-arched, humpbacked structure of the country districts in England contrasts sharply with the massive single-arched steel affair which spans the Grand Canyon of the Colorado, or the St. Lawrence above Quebec (Fig. 63). The many-sectioned steel Forth Bridge is markedly different from the many-sectioned wooden trestles which carry American railroads over obstacles sufficient to daunt less confident builders.

In landways we see the two factors of use and time-period determining the nature of the track and the vehicles used, modified by the potent third factor, the environmental complex, producing such forms as deviations from the straight line, bridges, tunnels, cuttings, embankments, and causeways.

The landscape of the waterway presents forms sharply contrasting with the above. Compared with the landway, the track is insignificant. Buoys to indicate a channel approaching a harbour, and lightships or lighthouses along a difficult coast serve as guides to mariners. Through the absence of the limitations imposed by width of road or gauge of track, the vehicle using the waterway lacks uniformity to a marked extent. It may range from a small pleasure boat to a liner of 60,000 tons. Owing to the nature of the medium forming the trackway, the methods of propulsion employed vary greatly. There are thus many different forms of vehicle depending on whether man-power, wind-power, steam, or oil is used. The size of the vehicle in relation to the propulsive effort can also afford to be greater because of the relative lack of friction between vehicle and track. Limitations do exist on an artificial waterway like a canal. These are depth and width. Such a waterway is very closely controlled by topography. In Holland a canal can often follow a straight line between points, but in England and other countries where the topography is marked, the route followed by a canal is winding

and practically coincides with a contour line. The difficulty of ascent and descent from one level to another is overcome by the construction of a lock or series of locks which form characteristic elements of the landscape of canals. The depth and width of the lock itself is usually the controlling factor in the size of the vehicle used. Close to the lock is the lock-keeper's house, and between locks, alongside the canal, the towing-path and the horse towing the barge form an important part of the landscape of the canal. The chief movable element is usually either a barge towed by a horse, as is commonly seen on most English canals, or a train of barges behind a tug as we find on the Aire and Calder Navigation. A ship canal is usually larger. The movable forms are then ships, and the lock gear in such a canal as the Panama is of a highly elaborate type to give ease of handling at the locks. A canalised river like the Thames forms an intermediate type. The only new form of importance introduced is the weir to give adequate depth of water.

Though the trackway does not in the case of ocean transport introduce any limitation in size of vehicle used, conditions at the ports do. Every vessel sooner or later must come to port. The port, while serving as a shelter for vessels, is in essence a transfer point, a point where sea and land, and therefore two different forms of transport, meet. Consequently break of bulk must take place here. It consists of the harbour with its defining piers or breakwaters, its buoyed and lighted approach channels, its landing piers and wharves, the depth alongside which mainly determines the size of vessels, its handling equipment of gangways, derricks, cranes, elevators, ropes, cables, its barriers for Customs control of passengers and goods, its warehouses and sheds for storing and handling goods, its docks with their gates behind which ships can be handled for unloading or repairing irrespective of the state of the tide (Plate 8), its railway terminal facilities, its motor trucks and horse lorries, its administration offices, its paraphernalia of commercial offices and stores connected with the shipping industry, and all the usual group of other activities to be found

at any large centre of population. These represent some of the typical items in the cultural landscape of a large shipping terminal, but break-of-bulk points as between sea and land range from a highly complicated large-scale port down to such simple terminals as a small fishing village or harbour, with its simple pier or wharf to serve as shelter for the fishing boats and a landing-place for the fish. Though the track in the case of sea transport is of minor importance as an item of the cultural landscape, the terminal is one of the utmost importance. Such a terminal may be described in terms of the cultural landscape as a concrete expression of man's adaptation of nature in the effort to satisfy the desire for handling and storing facilities at the junction point of two systems of transportation.

Like sea transport, air transport has no clearly defined track as a form of the cultural landscape. Like sea transport it has, however, certain guides comparable to lighthouses and lightships, buoys and lights. Beams and marked areas guide aeroplanes. Many municipalities have at the request of aero clubs marked clearly such prominent objects as gasometers. Like sea transport, it can take the shortest line between points with certain exceptions. Like sea transport, it also has its terminals which form the main modification of the natural landscape. The chief feature of these terminals or airports is a large circular or oval patch to form a landing-ground (Plate 11). Suitably placed on it are the shelters for the aircraft, the waiting-rooms for passengers, the stores for goods, the administrative offices, the control tower from which the arriving and departing aircraft are controlled, and the sausage-shaped wind indicators flying high from their masts, to tell landing pilots the direction of the wind.

Air transport can be conveniently divided on a vehicular basis into aeroplane and airship systems, that is, systems using lighter-than-air or heavier-than-air machines. The resulting cultural landscapes differ mainly in the sizes of the craft. But the shelters needed for airships are large and form striking features of the terminals. The mooring masts also needed by

them are not required by aeroplanes. As movable elements of the cultural landscape of air transport, seaplanes exhibit certain minor differences from aeroplanes, and their terminals are chiefly modified because their landing-ground is water instead of land. Airports with their related movable elements are forms of the cultural landscape which are multiplying rapidly in response to the increasing demand for rapid transit. They can be defined as the objective expression of man's adaptation of nature in the effort to satisfy that demand.

In studying the cultural landscape of transport we observe its threefold character—the traffic way, the vehicle used, and the terminals, though the relative importance of each as forms of the cultural landscape varies with the different systems in relation to the environmental complex and the time-period factor. We see also that the cultural landscape of transport is one which has grown and is growing more and more in complexity with the development of settlements and manufacturing industry, and it is one which enters intimately into all the activities by means of which man satisfies the more urgent demands of his material nature.

Man also demands recreation (Plate 12). In satisfying this demand he makes many adaptations of nature in the form of his golf courses and playing-fields. By so doing he utilises sandy land or other waste land. His seaside resorts and other pleasure towns are adaptations of nature in response to the demand for recreation. The degree to which these adaptations play a large part in the cultural landscape depends partly on the nature of the recreation provided, but is chiefly due to the numbers of people who are in a position to avail themselves of the recreation provided. The effect of a grouse moor on the cultural landscape is chiefly limited, apart from shelters for the shooting parties on the open moor, to the hunting lodges and gamekeepers' houses. The effect of Blackpool or Douglas on the cultural landscape is mainly determined by the number of people who visit it. The details vary largely with the tastes of the people and the nature of the environmental setting (see Chapter 15).

Man's nature has its æsthetic side, which has been developed to a greater or less extent among different peoples partly in response to the wealth and leisure available and partly to an instinctive inner craving. This æsthetic side of his nature requires satisfaction partly through the consideration of natural beauty, and partly through the beauty of form and colour and substance of the things he makes and the activities he carries on. Beauty, in this connection, has been adequately defined recently by Mr. Barton as "fitness for purpose . . . so long as you think not only of physical purposes, but also of the spiritual purposes which all this apparatus of civilised life is intended to serve."

So in satisfying all his material wants it is possible for him to gratify his æsthetic sense through producing beautiful objects, beautiful buildings, and carrying on activities in as finished and perfect a way as possible. In so doing his æsthetic sense is definitely modifying and moulding the cultural landscape, and it in its turn is moulded and modified by the natural materials which he has available, and the physical setting in which the work is done and the finished object is placed. Thus while York Minster as a feature of the cultural landscape primarily is the expression of man's adaptation of nature in the effort to satisfy the demand for a particular form of religious experience, the Gothic beauty of the whole in its effect on the spirit of man gratifies his æsthetic sense, quite apart from, though often in relation to, religious experience, and can be regarded as an expression of man's adaptation of nature in the effort to satisfy the æsthetic sense in addition to the religious sense (Plate 12).

In similar fashion the preservation of beautiful old buildings and monuments, the setting aside of open spaces as national parks and preserves for the people, and the cultivation of flower gardens, are expressions of a response to this æsthetic urge. Thus the restored Old-English houses of West Wycombe in Buckinghamshire, the preservation of beautiful Swithland Wood in Leicestershire, the glorious flower gardens of most English homes, are all expressions of man's

adaptation of nature in the effort to satisfy his æsthetic desires.[1]

In concluding our analysis of the cultural landscape we do well to remember its essentially impermanent character. The degree of impermanence varies much with the character of the activity producing the landscape, the time-period, and the environmental complex. What was a highly tilled field two years ago close to my home at Leicester passed into the hands of a speculative builder, went out of cultivation, is now covered with grasses, and apart from the lack of heather, is indistinguishable in general appearance from a piece of moorland. To-day it is crossed by numerous well-beaten footpaths, which look as if they were of considerable antiquity, yet merely represent the utilisation of the area for evening and week-end walking. In other words, the landscape to-day expresses the utilisation of the area for recreational purposes. Slowly at one end building is beginning ; soon it will be entirely occupied by private residences. A new suburban residential district will have developed where open country existed a few years earlier. This, in its turn, with the growth of the city, may be replaced by a retail shopping district, or should there be a decline in the growth of the city, might even become slums.

The stream of men and horses pouring into California and dying in many cases on the way to the goldfields in 1849 ; the massed crowds listening to Hitler at the Ballplatz in Berlin ; the covered wagons crossing the western plains on the Oregon trail ; the training camps and munition centres set up during the Great War ; the lines of tents erected on the Mississippi levees during the great flood of 1927 ; the reclamation of grassland or wasteland for cultivation in times of food shortage : all these are more or less impermanent forms of the cultural landscape brought about by stress of circumstances to satisfy human desires.

[1] We may also note that though many forms of modern mechanism are ugly, those designed to function efficiently for speed frequently have a beauty of contour and rhythm of line which both fits them for their material purpose and appeals to the feeling for harmony in the æsthetic sense of the onlooker.

It is only with difficulty that we can, in most areas, reconstruct the cultural landscape of the past. It is still with us in the castles, the walled cities (Plate 12), the ruined abbeys, and the old houses of many parts of Britain, and it is still with us in the deserted farms, with their decaying and overgrown fences, barns, and fields of northern Maryland. Many areas from the standpoint of land utilisation have passed through a cycle in course of which a period of collecting forest produce or hunting animals has given place to farming, which in its turn was replaced by a period during which the land reverted to its former condition or was put to recreational uses, as in many of the Scottish moorland areas. In each case the cultural landscape is distinctive and expressive of the activity carried on, and in many cases the units of the cultural landscape expressive of one form of land utilisation are carried forward in a half-ruined condition into the next period, themselves modifying and being adapted to the new landscape. In some areas we have two distinct cultural landscapes existing side by side in the same environmental setting, as in Brittany or East Africa. This would indicate that the natural landscape itself is not the driving force in producing the cultural forms, but rather man's activity and the processes, the state of his knowledge which, in order to satisfy his desires, he applies to the physical setting.[1]

The reasons for these changes are many and are mostly due to changes in man's activity and not to changes in the environmental complex. We are familiar with the way in which a rubber ball resumes its shape when the pressure of the hand is removed and to the degree that pressure is removed. It is true that the resiliency of the ball to some extent determines

[1] Mr. F. Elgee's paper "Human geography of the moorlands of north-eastern Yorkshire," at the meeting of the British Association in York, 1932, brought out excellently the many changes in the human occupancy and use of that area from Mesolithic times, as indicated by the flint implements below the peat, to the farms and iron workings of to-day. Each stage of culture produced a distinctive cultural landscape, the forms of which have in part disappeared, and in part have persisted or been absorbed into the cultural landscape of to-day.

the nature and the degree of the pressure. The analogy is not strictly accurate, but when, for any reason, man's activity is modified in any region, nature strives to carry on as before, and re-establishes something resembling the original landscape with extraordinary rapidity. Where a striking natural phenomenon such as an earthquake shock as at San Francisco, or the bursting of the banks of the Yellow River at Kaifeng, or a West Indian typhoon, or even the coming of a swarm of locusts to a maize field, or the volcanic eruption of Mont Pelée occurs, then immediate and rapid changes take place in the cultural landscape. These affect both the 'fixed' and 'movable' elements. Square miles of cultivation may be wiped out, bananas and maize crops destroyed, cities obliterated or reduced to ruins, the processes of exchange interrupted, and man killed or rendered homeless and forced to reconstruct the cultural landscape there or elsewhere. Of a somewhat similar character are the changes due to war, especially to a war on the scale of the Great War. In it settlements, cultivation, fields and farms, roads and railways, transport terminals, and other forms of the cultural landscape including man himself were ruthlessly destroyed, involving much effort in labour and capital, time and thought, to restore or replace. This destruction, though rapid, was not due, however, to nature's forces but to man's imperfect development.

Most changes, however, are slow, and due to changes in the conditions of human activity. The growth of scientific knowledge as to better ways of using and producing materials for the satisfaction of human desires, and the consequent introduction of new techniques in processes of manufacture, means of communication, and methods of cultivation, are prolific causes of change. The development of canals and the invention of the locomotive led to new cultural landscapes of transportation. The motor-car has not only led to better roads and added units such as garages, but has resulted in the rapid expansion of the areas under cultivation for rubber—a highly specialised landscape of cultivation. Hydro-electric power has led to the increased production of copper with the

resulting cultural landscape of pits and smelters, as well as to its own specialised features of water-power plants and high-tension transmission lines. The general development of machine production has concentrated large numbers of people in comparatively small areas with the added units of factories, houses, shops, new modes of life, and conditions which are not always satisfactory. Lack of adequate planning ahead results to-day in still further changes in roads, housing schemes, streets, and amenities. This has led to alterations in the landscape at very great expense which could have been partly obviated had effective regional planning schemes developed at an earlier date.

Changes may also be due to the shifting of political boundaries, as in the case of the development of the cotton industry on the western flank of the Vosges, the working out of mineral supplies, as in the tin regions of Cornwall, or the exhaustion of the plant food in a particular soil area as a result of over-production or extensive farming, as in Russia or parts of Africa. In the cases of over-production and 'soil-mining,' and there are many like them, the cause of change might be held to be inherent in the activity itself, but from another standpoint it might be held to be inherent in the nature of the environment.

Though the cause of change may be to some extent a matter of debate, the fact of change is undisputed, and the geography of the past may be considered to be made up of a series of adaptations of nature to man's changing desires, each stage of adaptation being expressed concretely in a more or less clear-cut cultural landscape, the successive stages of which are modified, as is a biological organism, by what has gone before.

Chapter 4

THE STUDY AND OBSERVATION OF THE CULTURAL LANDSCAPE

Detailed methods of preliminary and field study for urban and rural areas, together with a technique for recording land utilisation. The place of the picture, the map, statistical material, and written descriptions. Methods of expressing the results.

THE analysis and classification set out in the preceding chapters is essentially tentative in character—a framework to serve as a temporary guide for future work. It may also serve, it is hoped, as a stimulus and a challenge to the establishment of something better and fuller. It must necessarily remain tentative in character until the surface of the earth as inhabited by man has been reasonably fully covered in detailed studies. This chapter is devoted to a discussion of methods which may be employed in such detailed studies carried out in the field and in the study, as a preliminary to establishing the specific relationship between human activities and their natural environmental backgrounds.

While the study of the cultural landscape is best carried on by the inspection in the field of the specific units of that landscape in their environmental setting, the work in the field can be both simplified and carried on in a more intelligent fashion through preliminary studies of illustrations, maps, statistics, and written material to the extent that such material is available. Further, this latter type of study is the only one which is available to most of us to acquaint ourselves with the cultural landscapes of the greater part of the earth's surface. Therefore a brief survey of the material to be obtained serves the double purpose of making the cultural landscape in its environmental setting more vivid to us for many different

areas and introduces us to the particular area the study of which we propose as students to undertake.

While maps and illustrations are both of prime importance, their function differs. For a preliminary study of individual units and for recording in the field their appearance, the picture is undoubtedly superior to the map. Though the location and area covered by the field of growing crops, the water-power reservoir and dam, the factory and the elevator, can be accurately shown on the map, the characteristic appearance of these units, and the way they differ in response to differing environmental settings, can only be conveyed effectively to the mind of the student through the visual appeal in the form of a picture. Thus the wheatfields of Canada, the maize-fields of the Middle West, the rice-fields of Japan, the wooden houses of America, the stone houses of the Cotswolds, the raised bamboo houses of the marsh dwellers in the Philippines, the thatched cottages of western Ireland, and the cities of London and New York, can all be effectively located on maps, but their differing appearances as responses to the influence of their varying physical settings on food production and shelter cannot be made thoroughly clear to the mind apart from pictures unless they are actually visited and seen. Coloured pictures are more effective than black-and-white illustrations since they convey better both the appearance of the cultural landscape and the nature of the physical setting.

The student of the cultural landscape is wise to make satisfactory collections of views. These are readily obtainable in the form of pictures and postcards, or can be cut from the pages of the illustrated press, which daily, weekly, monthly, and annually provides him with partial substitutes for an examination in the field of the units of the cultural landscape. Few illustrations with any human appeal cannot be classified under some one or other of the types we have discussed. Such work is excellent practice for study and impresses the facts on one's mind in a marvellous way. To these one's own and one's friends' photographs should be added, classified, and the whole filed away in portfolios purchased or easily made by the nimble-

fingered at home. Not only do such views give us the individual units, but distant views and especially aerial views show us the physical setting and the compound units in their proper place in that setting. Every keen student of the cultural landscape becomes sooner or later a photographer unless he has one constantly about with him.

Another form of illustration which is becoming increasingly available to geographers through the work of Mr. Fairgrieve and others, is the moving picture. It would be beyond the scope of this work to examine its advantages and limitations. For those of us who have been fortunate enough to see such films as " Conquest " and " The Bridge," it is clear that while the still picture depicts the structure or anatomy of the cultural landscape effectively, the moving picture gives us its activity, its physiology, its movable features in action, to a degree that nothing else short of the actual seeing of the activity in the field can give us.[1]

One of the chief differences between a map and an illustration is that instead of showing us the features of the landscape as they appear to be and in perspective, the map locates for us, by means of a series of symbols, selected features of the landscape to a true areal, and in some cases vertical, scale. The nearest approach to a map short of a scale model is, from this point of view, a vertical aerial photograph. The relative ease with which a map can depict in true areal relationships, over a large or small area, the features of the cultural and natural landscapes, makes it the best medium for showing distributions, and the patterns which they assume in relationship to each other. These patterns are extremely suggestive in any study of geographical relationships. The map is thus peculiarly the vehicle of the geographer in his effort to bring out clearly the relationship between man's activity and the physical setting.

While the message of a picture, told in a universal language, appeals to all, a map, like a national language, a collection of

[1] Many of those listed in the Catalogue of the Empire Marketing Board's Library are excellent for this purpose.

symbols, known only to those who have learned what the symbols mean, needs to be read by the expert. A map regarded as a collection of symbols is not essentially different from the external world which it records, since everything is known to us by symbols. The trees, the hills, the buildings, which form both cultural and natural landscape, are but symbols of the ideas which stand behind. They are, however, expressed to us in universal picture symbols understood by all. Most early maps followed them by using picture symbols freely. Difficulties of scale prevent the placing of these picture symbols on detailed maps. Simpler symbols have been devised to take their place. Ideally, in converting to map form, a symbol should be used which, within the limits of space, etc., best conveys to the mind the original. In this way the valuable eye appeal can be kept at a maximum. Blue used for water, green for vegetation, shading in one colour for relief, with different degrees of depth to indicate varying densities, can be employed to carry out this principle. No matter how much we try to apply this principle we find many symbols, such as contour lines, which do not convey to the uninitiated any hint of that for which they stand.

Thus the student of maps, like the student of a language, must acquire ability both to read and to write the symbols fluently if he is to become a successful map reader and map compiler. Until a map reader can read a map without stopping to ask himself what the symbols mean, he is far from knowing his job, just as is the language student in a similar case. With practice a student reacts unconsciously to the symbols as does a competent motor driver to the circumstances in which he finds himself. It is no part of our work here to teach map reading, but it is essential for us to realise something of what is involved in map reading, if we are to appreciate the extent to which map representation effectively expresses for us both cultural and natural landscape.

Through symbols the map presents simultaneously to us many different sets of selected facts about both cultural and natural landscape. It is a mine of fact into which we have to

dig. As many different sets of facts are presented to the mind at the same time, it becomes desirable to separate each set into groups, so that the pattern pertaining to the distribution of the facts in any particular set may stand out clearly to the mind. The average detailed map, such as the 1 in. O.S. map of England and Wales, contains, among others, sets of facts relating to the distribution of buildings, roads, railways, bridges, cuttings, embankments, tunnels, mines, and reservoirs —all parts of the cultural landscape, and sets of facts relating to the shape of the surface, the drainage, the vegetation, as parts of the natural landscape. A tracing of the distribution of buildings shows the main facts as to the arrangement of man's shelter units. These then stand out in a more or less clearly defined series of patterns (see Chapter 7). Similar tracings can be made of sets of individual units relating to transport or mining, and of the main elements of the natural landscape such as slope and drainage. The various patterns can then be compared readily by placing one on the other, and the relationships suggested to the mind examined, and confirmed or rejected in the field. Sound generalisations ought not to be made merely on the basis of coincidence of distributional pattern. Such coincidences may stand in the relationship of cause and effect, they may both be due to some third factor unknown, or they may have no relationship beyond the mere coincidence. Any deduction made needs confirmation as a result of work in the field. Generalisations based on work in the library or map-room are useful working hypotheses which serve as rough testing or measuring rods for field work. Care is needed to see that they do not bind ahead or blind the mind to that which a more detailed examination of the facts on the ground may reveal. This does not imply that every part of every region should be examined in immense detail, but it does imply that as a result both of a preliminary survey and a general survey on the ground whereever possible, detailed studies of typical areas should be undertaken to illustrate the general type. We can only speak with confidence about such areas when this has been done.

Useful preliminary guidance as well as guidance in the field can be obtained from statistical data. Such data is produced increasingly year by year and of enhanced value. The most valuable sources of this data are probably government publications. From them information as to crop production and acreage, mineral and industrial production, exports and imports, trade and shipping, road and railway activities, can be obtained. Such information can be used directly as given, or converted into ratios, densities, or percentages. In either form it can be used for the construction of distributional maps where maps can be had for the administrative areas to which the information refers. Such maps usually take one of two forms. Of the first type, dot maps, such as the series showing agricultural distributions in England and Wales done by Pryse Howells at Oxford, or those in the *Geography of the World's Agriculture*, by Finch and Baker in the United States, are excellent examples (Figs. 27 to 32). In constructing them, dots, each one of which stands for a definite number of fixed or movable units of the cultural landscape, are inserted in their appropriate place on a map of the region to which they refer. Isopleth maps are an example of the second type.[1] In making them, percentages or other ratios based on administrative areas are used to fix points which are then connected by a series of lines somewhat similar in character to contour lines, the spaces between the lines being coloured appropriately to bring out the relative densities of distribution.[1] In another type of map the actual areas to which the ratios refer are appropriately coloured.

The dot map enables the quantitative results of human activity to be positioned effectively on a map in relation to the environmental complex. Such positioning is limited by the size of the administrative areas to which the statistical material refers. Many maps show the areal position of the units of the cultural landscape which we think of as a wheatfield or as a group of wheatfields. Thus wheat growing in two regions

[1] See map of India, "Per cent. of Local Land Area in Crops," Jones, *G.R.*, July 1929.

may cover the same or approximately the same area, but for environmental or other reasons the yields of the two areas may be very different. By means of the dot system the varying quantitative yields of two fields or groups of fields can be brought out.

While the dot system of mapping makes an effective eye appeal, its main defect lies in the difficulty of making satisfactory quantitative comparisons of groups of facts relating to different products. Further, it cannot show the quantitative relation between sets of facts which is frequently more significant than the absolute figures. Such relationships can be very effectively shown, within the limits of the material available, in the form of isopleth maps [1]. Thus the relationship between corn and other products, between dairying and other forms of activity, or between livestock and arable products in a region, can be expressed in the form of ratios which can be mapped to produce an effective isopleth map which brings out clearly the position of each of these main activities in relation to the other activities of the region.

Quantitative maps can be employed to express statistics of movement. Lines are drawn to indicate by varying number or thickness the movement of goods, passengers, or vehicles. Many illustrations of this kind of mapping can be found in government publications, particularly in the U.S.A., and in Professor Sargent's *Seaways of the Empire* the linear method is effectively applied to sea transport.

Where they are available, written descriptions in the form of books, reports on local conditions, local histories and reviews should be carefully studied beforehand with a view to acquiring as much general information as possible about a region before entering the field. Much material of this kind can be obtained for many areas, but it needs to be very judiciously used and verified by the geographer.

Models have not been dealt with in this survey of the materials available for preliminary study since good models of detailed areas are seldom found except for certain areas which have been already intensively studied. Further, while

models, where they do exist, are an excellent introduction to the study of relief and drainage, they seldom show many facts of the cultural landscape other than those indicating transportation and the utilisation of water-power resources. The perfect model, did it exist, would be the nearest possible approach to conditions as they are actually found on the ground.

Before entering the field we have some five different types of material which may be available for preliminary study. Re-examining these we may say that from the standpoint of the units of the cultural landscape, illustrations, in the absence of models, best tell us the form and appearance of the individual units in their physical setting, and moving illustrations the activity of these units. Maps enable us best to study their distribution and the patterns assumed by that distribution from the areal point of view. Statistics, especially when effectively expressed in map form, tell us best the distribution of these units from the standpoint of volume. To take a specific example, a coloured picture tells us best the appearance and general form of a wheatfield, a moving picture the activities connected with the production of wheat, a map the general distribution of wheat cultivation in any area, while statistics in adequate map form enable us to distinguish between wheatfields which in area may be identical but which from the standpoint of yield may differ markedly. Statistics in the form of ratios further enable us to tell in relation to other activities the position of wheat-growing in a region.

Put briefly to emphasise the leading characteristics of each method, illustrations show form, appearance, and activity of, maps tell us areal occupancy by, statistical material in map form gives us cubical content, or output of, the units of the cultural landscape, thus giving us the four main things we as geographers want to know about the cultural landscape—its appearance, the area covered by it, the volume or output of it, and the activity which binds it all together. For fuller knowledge of these things we must turn to direct observation and written description, the latter giving us additional information of a less exact kind. Each method gives us some-

what similar information in relation to the environmental complex.

As a result of preliminary studies along the foregoing lines we have a more or less general idea of the cultural landscape of an area, of its relationship to its environment, and of the character of that environment. We know in a somewhat sketchy fashion, the extent to which man has adapted a particular environment in process of satisfying his needs. We also partly realise the lacunæ in our information. We enter the field to make more exact our knowledge by direct observational work undertaken in the region itself and by intensive detailed studies of sample areas selected partly as a result of our preliminary work and partly as a result of general reconnaissance work on the spot.

On starting our field work it will help us if we keep steadily in mind what we are out to do. We are out to find exactly how man uses the region, why he so uses it, and how far he is likely to continue to use it in the present or in some other fashion. Since the objective expression of the present use is the cultural landscape, our first business is to observe, to map, and to describe it. The extent to which this is necessary will depend in part on the extent to which it is already done, but even where already done the work should be carefully checked and additions and other changes noted. Thus on the 1-in. O.S. maps of the British Isles transportation lines and buildings are already mapped, but as each map only represents the position at the date of the last revision, the items should be carefully checked when on the ground.

In actual field work of this kind our main piece of apparatus, where it exists, is the map. Where it does not, one must be made. Within limits, the more detailed the map the better. For most rural areas satisfactory work can be done on the basis of the Ordnance Survey map on a scale of 6 in. to the mile. This map shows every house and the field boundaries. On it can be mapped comfortably the elements of the cultural landscape of the country-side apart from those already mapped, e.g. the growing crops in the fields, the extent of permanent

pasture, of rotation pasture, of land under market garden produce, and of land devoted to orchards and small fruits. These and other facts about the cultural landscape need to be observed actually in the field and recorded either on the appropriate 6-in. sheet, or on a tracing made from that sheet.

While the facts about the cultural landscape are relatively clear-cut and easy to observe and record, those about the natural environment present greater difficulty. The units of the natural environment are each a complex product of a blend of different factors. No uniform system of classification has as yet been generally adopted which would enable one readily to observe them and record them in the field. Owing to the almost infinite variety of types, such classification is difficult. The chief attempts so far along this line are those of the German geographer Passarge (see Chapter 6). The present writer submits in Chapter 6 a classification worked out independently, based on work done at Leicester. It is highly desirable that such uniform classification should be attempted for use on as detailed a scale as possible. Failing such development, one is driven back to the simple elements which go to make up that environment. These may be usefully classed as three major elements and three minor ones, the latter being in essence derivatives from the three major ones. The three major ones are structure, climate, and slope or topography. The derivatives are soil, drainage, and natural organic life including plants and animals. Each of these three is a function of the first three.

From the standpoint of normal mapping in the field we may rule out climate and structure. In the English countryside we may generally as a matter of practice also rule out vegetation as a part of the natural environment. It is either already mapped by the Ordnance Survey, or it is non-existent in the areas utilised by man. We are left then with three which are either insufficiently mapped or are unmapped. These are slope, soil, and drainage. Each one of these is of great importance in rural areas in determining the degree to which man has been able to adapt nature to satisfy his needs.

The student of the cultural landscape in the field can determine slope and drainage with sufficient accuracy fairly readily by inspection. Soils present a greater problem, but with the aid of a spade, a simple acidity test, a little experience, and the drift map, a rough approximation to physical classification, which while far from being all that might be desired is better than nothing, can be made by the observer, until soil science in this country has reached the stage of detailed mapping on a large scale. Structure has been already mapped with great detail by the Geological Survey. A study of the structure of any region from the geological maps and memoirs is a necessary preliminary piece of work for every field worker. Climatic data cannot be usefully gathered by him, since the time available is usually too short and the area covered too small, but notes of a general character based on such information as can be obtained should be made.

The method of recording one's observations as to the surface utilisation of the land varies in practice. A series of symbols may be adopted, e.g. vertical strokes for cropped land, diagonals for pasture, etc. Or a system of initial letters can be used such as that advocated by the Land Utilisation Survey of Great Britain organised by Dr. Dudley Stamp. While exceedingly useful and highly desirable up to a point, the writer has found as a matter of experience that these systems suffer from two defects. They do not record the facts as to the utilisation of the land in sufficient detail for our purpose as students of the cultural landscape, since it is of great importance in many areas to know not merely that a certain area of land is cultivated, but to know also what crop is being grown. It is also further desirable to have some idea as to the condition of the crop.

Secondly, it is more desirable and more scientific when mapping in the field to record both the cultural landscape and the elements of the natural environmental complex at the same time, since the observer is thus forced to group together, and to note the grouping of, or relationship of, the facts that matter on the spot.

To overcome these difficulties the writer has adapted for the Leicester Survey a notation system, the idea of which was first put forward by Professor Wellington Jones of the University of Chicago, and Professor Finch of the University of Wisconsin. Under this system the facts which it is desired to record in each field or area are indicated by a fraction containing three digits in the numerator and three in the denominator. The numerator indicates facts about the cultural landscape; the denominator the three elements of the natural environment referred to above which are likely to affect the uses to which the land is put, namely, slope, soils, and drainage conditions. With the aid of this fraction the more important observable and recordable facts needed to establish the relationship between human activity and natural environment can be recorded readily in a small space.

This notation system is as follows:

Surface Utilisation (noted as numerator)

First digit

1. *Cultivated Land (brown)*

   Second digit

   1, Wheat; 2, oats; 3, barley; 4, rotation hay; 5, clover; 6, market gardening; 7, orchards; 8, rotation pasture.

2. *Permanent Pasture or Meadowland (light green)*

   Second digit

   1, Grass pasture; 2, wooded pasture.

3. *Idle Land (uncoloured)*

4. *Mining (crimson)*

   Second digit

   1, Coal; 2, iron; 3, quarries; 4, others.

5. *Forest Land (dark green)*

   Second digit

   1, Coniferous; 2, deciduous; 3, mixed; 4, coppice; 5, scrub; 6, cutover; 7, others.

6. *Heathland, Moorland, etc. (yellow)*

   Second digit

   1, Heaths; 2, moors; 3, commons; 4, rough pasture.

7. *Recreational Land (diagonal strokes)*
   Second digit
   1, Golf courses; 2, playing-fields; 3, open spaces; 4, others.

Crop yields or carrying capacity of land

The third digit of the numerator is used, where the information can be obtained, to indicate roughly the above as follows: 1, high; 2, medium; 3, low.

The major use to which the land is put is indicated in the above table by the first figure in the numerator, the detail of that use by the second figure, and the yield or carrying capacity of the land by the third. The colour in parenthesis is used in preparing maps as a base for the major use. Where a very detailed study is being carried out, figure 8 in the first position is used to indicate a farmstead, a figure in the second position is allotted to the farm, and has reference to detailed notes made in a notebook. A figure in the third position indicates the general condition as to repair by 1, good; 2, fair; and 3, poor. In place of the digits used in the above system it would also be possible while retaining the framework of the system to substitute initial letters, if found more convenient by some workers.

The surface conditions of the natural environment likely to affect the cultural landscape are indicated in the denominator of the fraction as follows:

Natural Elements of Surface

First digit, Slope
1, Level, or nearly level; 2, moderate; 3, fairly steep, difficult to cultivate, and likely to wash; 4, steep, impossible to cultivate.

Second digit, Soils
1, Clay; 2, clay loam; 3, loam; 4, sandy loam; 5, sand; 6, marl.

Third digit, Drainage
1, Good; 2, poor; 3, bad.

Thus the fraction $\frac{112}{122}$ taken as an example of the above technique indicates that the area to which it refers is a piece

of cultivated land, the crop being wheat and the yield medium. It further indicates that it is being grown on land level or nearly so, that the soil is a clay loam, and that the drainage is poor.

While the mapping described above forms the core of the work on the ground, it should be supplemented as fully as possible by information in the form of notes gathered in interviews with farmers, merchants, officials, and others competent to give authoritative information of a type not commonly found in print in the literature on a region. All such information needs careful checking where possible, and some indication of its relative value given. The worker should as far as possible go into the field equipped with introductions to as many suitable persons as possible. Where introductions are not available, however, he need not hesitate to get into touch with individuals on the spot, as with the proper approach and a brief account of the work he is doing he is very unlikely to meet with anything but the utmost courtesy and consideration if he is displaying both himself.

To supplement and crystallise such information much can be done by submitting judicious questionnaires. The following, filled in by the farmers in the Helidon district (Chapter 9), may serve as an example. It was made clear to them that the details obtained from individuals would not be published, but used merely to form generalisations based on such detail.

Questionnaire for Farmers

1. Total acreage of farm.
2. Acreage and yield of crops:
   Wheat, acres yield,
   Oats, acres yield,
   Barley, acres yield,
   Other grains, acres yield,
   Rotation pasture, acres Livestock on,
   Fruit, acres Chief sorts,
   Vegetables, acres Chief sorts,
   Total cultivated land, acres

3. Amount of fertiliser used,
   For what purpose,
4. Rotation system employed,
5. Acreage under pasture,
6. Number of livestock:
   Cattle, dairy — Number in milk,
   Cattle, beef — Approximate age,
   Sheep,
   Other livestock,
   Milk yield, gallons,
7. Feeding stuff bought,
   How used,
8. General character of farm soils,
9. Labour employed, men, women, where from,
10. Extent to which machinery is used,
    Power machines,
    Other machines,
11. Nature of water supply,
12. Timber supply of farm,
13. Markets to which produce is sent,
14. How it is sent,
15. Year for which information is given,
    and/or does it represent average conditions,
16. Extent to which it departs from the average,
17. Any recent changes in farm practice,

In so far as time permits full notes should also be written, based on personal observation of the facts of the cultural landscape, the elements of the environmental complex, and the relationship between them. Such notes should cover the building material used in the district, its relation to the environment, the character of the roofs, walls, and hedges, fences and other boundaries, the condition of the paths and roads, and all such other information about the utilisation of the land as is not obvious from the work already done.

It is particularly valuable to write down as frequently as possible one's impressions. These usually strike one more

forcibly on a first visit than ever after when they have become to a certain extent familiar. In this lies the value of full impressions and careful summaries, particularly when passing from one type of utilisation or environmental area to another. The value of such impressions can be greatly enhanced if supplemented by simple sketch-maps and profiles.

Although little has been done to classify satisfactorily natural areas, it is useful in all areas studied to attempt such classification on no matter how simple lines, as has been done in the case of the Helidon area in Chapter 9. This region is tentatively classified into porous cultivated plateau, heavy clay grassland, hill slopes grassed and mostly suitable for sheep, and steep marlstone edge partly cultivated but mostly under grass owing to slope.

In attempting such classification, perhaps the best way is to select by inspection what appears to be a fairly typical piece of country. Note carefully the characteristics of both the cultural complex and the environmental complex. Then see how far and to what extent these repeat themselves in the adjacent areas, and draw boundaries accordingly. Repeat the process where a sufficiently marked change occurs to justify repetition and the definition of a new area. Thus certain type areas, possibly with transitional zones, stand out, and a useful map which is more truly geographic than any other we can construct can be made. Such geographic areas are areas within which there is essential unity of the facts of the cultural landscape coupled with essential unity of the elements of the environmental complex.

While much of our work as students of the cultural landscape has to do with rural areas, the increasing development of manufacturing industry accompanied by great growth of population and concentration in towns and cities has led to increased desirability for intensive study of urban areas. The citizens of such centres are engaged to a greater or less extent in the processes whereby man's material wants are satisfied. In other words, they are engaged in the production of goods

and services and the distribution of those goods and services among those who are entitled to share.

These activities cannot be regarded satisfactorily as a series of detached pieces, but must also be viewed as a whole, a unity, or, if we may again borrow a phrase from biological science, as an organism, every part of which is necessary to the successful functioning of the whole. The activities of the organism are directed to satisfying certain wants of the organism in the shape of food, clothing, shelter, etc. These are in part satisfied by the direct production of the thing needed, as in the making of boots, hosiery, etc., which are used by the citizens, and in part satisfied by the production of a surplus of commodities which, instead of being consumed on the spot, are exchanged through the normal channels of trade for other commodities needed to satisfy local wants. Every piece of activity in a city has its place, its essential place, in the functioning of the whole, just as every cog and lever and wheel has its place in the smooth working of a piece of mechanism. If any one trade or municipal activity or transport service is not functioning smoothly, it is, to the extent that it is not so functioning, letting down the whole. No man or trade or service can live to himself alone.

This community or city organism, and every part thereof, is intimately related to the environment, natural and otherwise, in which it is functioning, for it is in the process of adapting nature to satisfy its needs, that it has built up the striking cultural landscape which houses and shelters it, and within which its activity is carried on. This landscape is itself the objective expression of the process of adapting nature. The establishment of this relationship as fully as possible, forms the main object of an urban survey. As in the case of the rural survey, the first piece of work needed to this end is the mapping of the main facts of the cultural landscape of the city as the expression of its major economic activities.

For use as a base map the 6-in. map is commonly too small, and the 25 in. to the mile map is needed. On this the Ordnance Survey has already marked clearly the areal space

occupied by every building in the city at the time the map was made or revised. Further, the more prominent public buildings, institutions, transport terminals, factories, parks, etc., are marked, but many are not, and the map contains no indication of the distribution of retail, wholesale, professional, and differing residential areas. It is thus necessary to take steps to record these on the map. For this purpose in the Leicester Survey the writer has adopted the system outlined below. Since in a city there are sometimes two layers of activity, one above the other, it is convenient to use the numerator of the fraction for the upper activity and the denominator for the lower. Three layers can be shown with equal ease. The first digit again indicates the major use, the second the details of that use, and the third where used the condition of upkeep. In the following table the left-hand digit showing the general classification is given first. The colours in parenthesis are used for blocking out the major features of the cultural landscape after the detailed work is completed in the field.

Surface Utilisation in Urban Areas

1. *Transport* (*black*)
   1, Railway line ; 2, railway station ; 3, tram line ; 4, tram station ; 5, bus station ; 6, garage ; 7, roads or streets.
2. *Retail Business or Shops* (*buff*)
   1, Food shops ; 2, drapers ; 3, shoe shops ; 4, hotels or inns ; 5, hairdressers; 6, ironmongers; 7, teashops or restaurants; 8, wine, beer, and spirit stores ; 9, chemists ; 10, others.
3. *Contractors and Storage Yards* (*black diagonals*)
   1, Coal ; 2, building ; 3, timber ; 4, others.
4. *Manufacturing Plants* (*violet*)
   1, Hosiery ; 2, boots and shoes ; 3, wool ; 4, engineering ; 5, printing ; 6, others.
5. *Public Utilities* (*yellow*)
   1, Post office and telephone exchange ; 2, waterworks ; 3, electric light plant ; 4, gasworks ; 5, fire station ; 6, destructor plant ; 7, others.

6. *Community Institutions (yellow with stipple)*
   1, Schools ; 2, university ; 3, churches ; 4, clubs ; 5, others.
7. *Recreation Units (green with diagonals)*
   1, Golf courses ; 2, playing-fields ; 3, parks and open spaces ; 4, theatres ; 5, picture houses ; 6, concert halls ; 7, billiard rooms ; 8, others.
8. *Residential Areas (pink)*
   1, Stone buildings ; 2, brick ; 3, stucco ; 4, others. (The third digit is here used for a classification based on the rateable value, thus tending to distinguish working-class districts, etc., and bring out the function of the areas. The 'form' is largely shown by the type of building and the area covered by and around buildings.)
9. *Professional (red)*
   1, Banks ; 2, insurance ; 3, lawyers ; 4, accountants ; 5, auctioneers ; 6, dentists ; 7, physicians.
10. *Wholesalers (orange)*
   The second digit for wholesalers is the same as that used for manufacturing plants.

Idle land is left blank with a brief pencil note.

Applying the above notation the fraction $\frac{94}{23}$ indicates that the ground floor is occupied by a retail business and the floor above by a professional firm of accountants. A map can be prepared on a smaller scale showing the distribution of the major groups of activities in the city. The mapping complete, the business of correlating the activities with the environment is undertaken, and we endeavour to determine how far the activities of the city are distributed on a geographical basis. In other words, how far man has here, in adapting nature to the needs of the civic organism, brought about a definite grouping of wholesaling, retailing, professional, manufacturing, municipal, and other activities. How far natural conditions have helped in the past and how far they are still helping or likely to help in the development of the existing or future activities.

The distribution of the main features of the urban cultural landscape, as a rule, are found to be closely related to transportation conditions by road, rail, or waterway. In the out-

lying residential districts the first shops develop at street crossings. The importance of the nodal point is exemplified throughout the city. Generally a definite grouping or pattern stands out which has been largely determined by the historical development of the various activities in relation to the surface conditions, areas, and transportation facilities available. From a study of these facts a clear picture of the general distribution of activities within and adjacent to the community centre is built up.

Side by side with this general work individuals and groups are engaged in the study of each industry or activity. The first thing needed here is a clear uncoloured account of each industry or activity. Such an account embraces its inception, its raw materials, their sources, the transportation systems involved, the conditions under which the raw materials are purchased and financed, the transfer to the factory, the handling processes through which the material passes, the sources of power, the special problems which have to be faced and overcome in the manufacture of the product, the final movement out of the factory, the special problems of marketing, those of labour and the organisation of the industry or activity as a whole, and finally the relationship of the industry or activity to the rest of the community organism, locally, nationally, and internationally.

It is possible and useful to treat every industry and activity in the above fashion, with suitable modifications made necessary by the nature of the industry or activity. Suitable schemes for study are best drawn up locally with knowledge of local conditions. The above systems of notation and colouring are based on English conditions and in some cases only on local conditions in Leicester. The notation for manufacturing plants is a case in point. It is desirable that such systems be modified or reconstructed to suit the special circumstances of each area, at least until a scheme on international lines is developed if local conditions are not too divergent to prevent.

We have now surveyed briefly the kind of material and the methods of study available before entering the field. We have

seen that illustrations give us form, appearance, and activity of the cultural landscape, maps give us the patterns of the areal distributions, and statistics in map form give us the productivity or output. We can thus obtain a general idea of a region. This needs to be made concrete and exact by detailed studies in the field. We have seen also something of the method of attack in the field, and the notation systems which can be employed in recording both the cultural landscape and the environmental complex for both rural and urban areas. We have still to consider how far our results may be best expressed, in so far as that has not been already indicated.

Our results in detailed studies should be embodied in some written form. Whether we call it report, essay, or paper, matters little, but it may be suggested that it should preferably be a report which is supplementary to, or explanatory of, rather than merely accompanied by, a series of maps, profiles, etc., which in themselves express vividly the essence of the relationship between man and his environment in the region studied.

There is, perhaps, more in this than meets the eye at first sight. If these maps are to contain and express the essence of the area, then they must be in the fullest sense of the phrase geographic maps rather than cartographer's maps. The cartographer sets out to observe and record with minute accuracy everything he sees. Such a map is really a book of reference and as such is extraordinarily valuable to the student of the cultural landscape. But it is not a map expressing the results of geographical research, and that is what a geographer's map should be in the sense in which we are now thinking of maps as a medium of expression. The geographer selects from a mass of minute detail the salient facts about the human activity of a region, the background against which that activity takes place, and the relationship between the two. He endeavours in his map to give expression to that relationship, laying emphasis on the points of maximum importance and, in the interests of clarity and effective expression, suppressing minor details which would only tend, if included, to obscure

the main issues. The essential difference between a map maker and a geographer is largely that of the difference between the photographer and the artist. The photographer records in minute detail that which is before him. The artist selects for record the essentials that seem to him to matter in expressing his point of view, and rejects the detail which does not aid, but would only hinder, what he has to say. He frequently has to tell or imply a minor lie in the interests of making plain a major truth. In drawing a map on similar lines the geographer must have the geographical sense highly developed. He must realise fully the difference between the Haack wall maps and others that shall be nameless. He must have gone through a period of training which teaches sense of geographic proportion, and have acquired the ability to simplify without distorting what he has to say.

Ideally, then, such maps are only possible as a result of great study of detail coupled with highly developed geographic sense and feeling. The ideal map is, doubtless, one expressing as a perfect synthesis the essentials both of the cultural landscape and the environmental setting. Certain combinations of slope, soil, structure, drainage, and climate tend to repeat themselves, and in each environmental combination certain groupings or combinations of the units of the cultural landscape may be found. The ideal map expressing our perfect synthesis would picture each cultural combination in its appropriate environmental complex or setting. Short of that, we may be content with two maps, the one showing the cultural complex, the other the environmental one. For some purposes we may still further increase the number of maps, provided we ever keep in mind that each map should be essentially geographic in endeavouring to depict faithfully the major salient facts in due proportion unobscured by those of lesser moment. The measuring rod to be ever applied here is the effect of the elements of the physical setting on the cultural landscape, including man, its motivating force. It cannot be urged too fully that one's ability to produce an effective map depends on the extent to which one knows, has absorbed, and

made one's own the facts. Only as a result of full knowledge can the necessary simplification be made safely. The ultimate test of such a map is the ' eye ' appeal, and by this standard it should be judged.

As supplementary to the map or maps many subsidiary devices may be used. Of these the profile, the diagram, and the graph are all useful. They each possess advantages distinctive in themselves. It would be beyond our scope to discuss each in detail. Of them the profile possesses especial value.

The profile, horizontal section, or transect, as it is now sometimes called, represents the surface of the ground and the lie of the underlying structure as it would appear could the surface be cut along a selected line and the cut surface exposed (Plate 11). Such sections are to be seen in nature in quarries and at points where the sea has cut into the base of and produced a vertical or nearly vertical cliff. Such a profile is readily constructed by laying along a line ruled on the map, the top edge of a piece of squared paper on which a base line or sea-level line has already been drawn in a suitable position horizontally. The various points where the section line cuts the relief contours indicating the height above sea-level at those points can then be readily transferred direct by inspection to the base line, thus obviating the need for taking separate measurements and transferring to the base line. Similarly the geological outcrops can be transferred to the base line, or directly to position on the profile. The dip of the strata can be inferred from the general sections available for such an area, or if great detail is desired must be inserted from well borings and calculations as to the lie of the strata in the region. The need for doing so hardly arises in practice in such a region as the British Isles, since many of the 1-in. O.S. maps, showing geological features, either have sections on the sheet, or separate sheets of sections have been issued.

In preparing such a section we should remember that from our point of view we are not endeavouring to convey the accurate information required by an engineer, but merely to

convey such information about the underlying rock layers as will elucidate the human activity taking place on the surface.

If over the profile or section we add such data as is indicated in Fig. 5, we convert our profile into a profile chart, which expresses in brief but effective form some of the outstanding relationships between human activity and environment in the region studied. The chief defect of such a profile is that it only shows the conditions along a selected line across the area. Should the area consist of a series of more or less parallel zones, and the profile be taken at right angles to them, then the chart produced admirably expresses conditions in the region. Where this is not so, care should be taken to indicate the extent to which the profile represents typical conditions.

The valley section devised by the late Professor Geddes may be regarded as a specialised type of horizontal profile primarily designed to elucidate his human types as products of the natural environment. It represents a generalised section taken from the highest land in a particular region to the lowest. It approximately follows the line that would be followed by flowing water. Its theory roughly is that between the highest mountains and the sea there are some eight different human rural types, each one of which is related to a particular part of the environmental complex. This is of course only true in idealised theory, but none the less Geddes's idea of the valley section can with great advantage be applied to the exposition of human relationships in many areas. A brief examination of the profile of the Lagan valley in Northern Ireland will perhaps make clear the extent to which this is so even in an area which at first sight seems unpromising (Fig. 5).

The Lagan rises on Slieve Croob in the Mourne Mountains in a region of high moorland, partly a game preserve. Parts of the area are used as hill pasture for sheep. The valleys are timbered. One of these is used for a large reservoir supplying Belfast with water. The heavy rainfall of the mountains insures an ample supply of the soft water needed for the textile industries. The lower slopes of the mountains are farmed mostly for sheep and cattle and some cultivation. The com-

munity centres are small villages such as Massford and Dromora. Near the edge of the hills at the junction line between hill and plain is the market town of Dromore. The middle portion of the valley is largely cultivated land, a land of mixed farming. Lower down the valley the land is wetter and we come to the great cattle-grazing regions of the Lagan. Here at Lisburn a linen manufacturing town has developed which is also an important market centre. Round it the grassland and pure air are used for linen bleaching. As we approach the mouth of the valley the high edge of the Antrim plateau rises steeply on the left and forms a range in which Divis and Cavehill are the chief summits. To the right are the low hills of County Down. At the head of the lough into which the Lagan flows is the city of Belfast, which grew up at the crossing point of the Lagan where routes from the south-west, north-east, and south-east focus. Owing to its position it has grown to be the chief outlet of Northern Ireland—the Lagan valley forming an easy line of movement into the lowland around Lough Neagh. It has developed as a manufacturing centre for linen, ropes, tobacco, and mineral waters. The shallow water at the head of the lough has been in part reclaimed to serve as sites for the great shipbuilding yards. The moorland edge to north for many years supplied the water needed from such reservoirs as those of Stonyford and Woodburn. A notch in the range carries the main road and rail northwards into the Antrim plateau. Between the edge of the plateau and the lough a narrow coastal plain carries the road and railway to the outport at Larne. These pass through Carrickfergus, which has developed a salt-making industry from the local sandstones similar to those of Cheshire. Seaside and week-end centres have also developed on both sides of the lough. Near the city itself in the Lagan valley are brickworks based on the local clays. The wetter lands near the city have developed dairying partly for city supply, while the drier, sandier areas are partly devoted to market gardening and partly to residential developments. The mountain edge and the lough shore, apart from the activities described, provide in

many ways recreational facilities. Up and down the waters of the lough move the vessels carrying such food and raw materials as are required, and the manufactured goods for sale elsewhere. Occasionally a great ship is launched. Shipbuilding forms one of the chief ways in which Belfast pays for the products she requires from other areas.

All these aspects of the cultural and environmental complexes of Belfast can be effectively shown in summary form in the profile chart (Fig. 5).

A passing reference might here be made to the method of expressing by means of geographical index numbers man's power or degree of utilisation of his environment. These may take many forms. Thus the yield of wheat in a specific environment over a period of years can be expressed in the form of a series of index numbers, or with the aid of a system of weighting it would be possible to express the utilisation of an area as a whole in terms of index numbers.

In all this work we need to keep clearly in mind that the cultural landscape as the expression of the relationship between man and nature presents a problem for solution in the field rather than in the study. Such problem so presented is threefold. We need to know firstly the nature of the activity as expressed in the landscape, secondly the physical setting in which it is found, and lastly the precise character of the relationship. The great advantage of the observation and study of the cultural landscape lies in the fact that it is the landscape itself which presents and in some senses is the problem which challenges explanation.

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Chapter 5

THE ELEMENTS OF THE NATURAL ENVIRONMENTAL COMPLEX

Structure, climate, slope, and the river valley in relation to the cultural landscape.

In this chapter we examine the elements of the natural environmental complex in which the features of the cultural landscape developed and through the agency of which they have been modified. It is difficult to produce a completely satisfactory classification of natural regions. That is not attempted in this chapter. It is useful, however, to make a partial analysis of the elements which make up the highly complex natural background in which the cultural landscape has appeared. The natural region is a synthesis or complex of the facts of physical or natural environment. The geographical region is a synthesis or complex of all the facts of distributional phenomena, including man and his activities, and as such includes both cultural and natural landscapes. It is difficult to subdivide the world into thoroughly satisfactory natural regions or units. Such subdivision has been attempted by Herbertson, Passarge, and others, and is referred to later. It is still more difficult to divide it into geographical regions, until the work indicated in Chapter 4 is carried very much farther than is the case now.

To make clear our exposition of the elements which make up the environmental complex we need a basis of classification. We may usefully direct our attention to our viewpoint that human activity, while modified by natural environment, takes place primarily to satisfy human desires. Wherever man can live he has the same fundamental desires—the desire for raw materials to satisfy the human desire for food, clothing, and

shelter, and above that his many less essential desires. The elements, therefore, of the physical setting which concern us, and the order of importance in which they concern us, is governed by the extent to which they influence or modify man's activities. Raw materials are produced either directly from the earth in such form as coal, iron, and building materials, or indirectly from the earth as vegetation, or animals. Though certain regions, as in the Sahara, may at present be described as negative, man has in other regions created great settlements in which he converts material products into commodities for human consumption, and provides the services needed to satisfy the less material of his desires. These manufacturing regions occur at points of maximum convenience in relation to raw material, the power used, the ultimate markets for the products, and the physical setting.

Human activity on land surfaces appears to be influenced by three major and three minor elements entering into and blending in various proportions to form the background against which the cultural landscape has developed. The three major are: structure, climate, and slope. The three minor are: soils, drainage, and organic life. Water areas and air as elements apart from climate are dealt with separately. Structure, used in the sense of the materials of which the earth's crust is composed, and the relationships between them, is placed first in the above list, since it is not only the ultimate source of almost all the material used by man, but it is the direct source of such building materials as stone and clay, of our two major types of power, coal and oil, and of the materials like iron and copper of which our machines are made. It is the foundation, in relation to other elements, of soils from which through plants and animals the rest of our raw material, including foodstuffs, is derived. Together with climate, and to a lesser degree other elements, structure forms the basis of slope. It is thus a principal factor in producing the various land forms which make up the surface of the earth. Because of its basic character as an element of natural environment, it is first examined here.

Structure, as we have seen, is a fundamental element in direct, and in some ways also in the indirect, production of materials. Climate is the major element in the indirect production of materials. Climate delimits mainly through precipitation and temperature the areas within which plants grow. It thus largely conditions the kind of plant and the methods of cultivation, including the organisation of plant production. It does not alter man's fundamental desires, but it does directly or indirectly influence the materials to be used in and the mode of satisfying many of them. Climate, together with structure, plays a large part in determining slope, the surface features of hill and valley, mountain, plain, and plateau. Soils are in the main a product of structure, climate, and slope, modified by drainage and organic life. Drainage is a product of all the foregoing. The outer framework of plant and animal life is composed of certain elements of structure, modified by climate, slope, and drainage, and used by plants and animals through the agency of water and soils.

Structure is thus the chief element affecting the cultural landscapes produced in obtaining materials directly from the earth. Climate is the main element affecting indirect production. The surface elements such as slope, soil, drainage, and organic life are lesser elements which influence the details of production. Thus climate delimits the zone within which it is profitable to cultivate cotton, while the surface elements of slope, soil, drainage, vegetable and animal life influence the areas of production within that zone, together with the intensity of production.

Structure

Structure, as we have seen, provides the basic stuff of which the greater part of the cultural landscape—the buildings, houses, factories, stores, in so far as they are made of stone, brick, cement, iron, or steel; the roads and steel rails, the causeways, pavements, dams, and walls; the fields, and to a lesser extent the growing crops and animals—is composed. The study of structure can be approached from many different angles. It

may be analysed under the different materials of which the crust is made, the igneous, sedimentary, and metamorphic rocks, and all their many subdivisions. It can be studied from the standpoint of the relationships between the different rock layers, the lie of the strata, the depth below the surface, and the extent to which folding and fracturing have taken place. All these and other angles of approach are useful and have their place. From our standpoint, that of the effect on the cultural landscape, we may perhaps usefully discuss structure under three main heads. It is a source of useful materials of which those for building and other constructional work, and minerals, either for providing power or making machines, are the most important. It serves as a foundation for slope and for constructional work such as buildings, roads, and dams. It is the main source of the particles which make up soils and therefore is the source of some of the chief elements of plant food.

Although in some places made of wood, the bulk of man's shelter units are of brick, natural stone, or artificial stone. Clays vary in their suitability for bricks and pottery, hence the location of suitable clays is an important factor in constructional work. In the arid parts of south-western U.S.A. much shelter work among primitive peoples has been carried out in adobe. This is also the case in Upper Egypt and other semi-arid regions. Clays for brick-making are mostly found in plains. For this reason, coupled with the difficulty of getting suitable stone in the lowlands, many shelter units are made of brick. Where stone is to be had it forms a more durable type of building material. Limestone is one of the most useful building stones since it combines durability with relative ease of working. Its hardness in some types of stone increases with exposure to the air. Shale is commonly too soft. Sandstone, where sufficiently durable, is freely used. Most of the igneous rocks are too hard for ease of working, but granite is an exception. Artificial stone for building and for all types of constructional work is increasingly competing with the natural product. It is made chiefly of cement and stone chippings such as granite. It is very durable

and can be readily moulded to any desired shape. It is extensively produced at such centres as Mountsorrel and Barrow in Leicestershire, where there are abundant supplies both of natural stone now largely used for road metal and chippings, and of limestone for cement making. The latter is an hydraulic limestone which sets well under water, and is excellent for coastal work. Where stone is in thin flakes and splits off readily, as in North Wales, it is used for roofing-slates. Cement made from limestone is employed in conjunction with sand and gravel for making concrete, now widely used in all kinds of constructional work from water-power dams to road surfacing. Structure, then, as an element in the natural landscape tends to determine the material used, and thus to a considerable extent the characteristic appearance, the utility, and the æsthetic value of many kinds of shelter and constructional units.

As a source of minerals, structure also plays a large part in the cultural landscape. On our deposits of coal and iron depends to a large extent the location of the landscape of manufacturing industry. Those of copper, tin, lead, and zinc influence many of the processes and machines connected with transport and manufacture, the distribution of electrical power, and the canning of fruit and vegetables. On the precious metals, gold, silver, and gems, depends in part the satisfaction of the desire for ornament and for a monetary basis. The great agglomerations of people on the British coalfields, on those of the Ruhr valley in north-western Europe, on the productive parts of the Appalachian coalfield in eastern U.S.A., to mention the three major concentrations of modern machine production in the world, are illustrations of the first case. The development of the hydro-electric industry and the tinplate industry are examples of the second. While the third is clearly seen in the gold-mining industry of the Rand in South Africa, which produces some 40 per cent. of the world's gold, and the many mining camps of Mexico, from which a large proportion of the world's silver comes.

While many of these products such as coal and iron are

widely spread throughout the world, the concentration of activities on particular parts of these areas is usually due to exceptionally favourable conditions for production. In past ages coal was produced from decaying vegetable matter in shallow lagoons. In process of time it was compressed and converted into the solid mineral we know to-day as our chief source of fuel. The other minerals existed disseminated in varying proportions through the crust. They were concentrated to form ores in three main ways. In the process of cooling, certain elements in the molten magma crystallised out to form masses of metal more or less pure. Other particles of mineral were dissolved from the parent rock either through the operation of warm water, or through that of water highly charged with chemicals possessing power to dissolve metals. This process is accelerated if the solution is under pressure or contains gases. On cooling or through the removal of pressure or gas, redeposition took place in crevices and cracks either in the original rock or in adjacent sedimentary layers. Lastly, through the normal processes of weathering, certain metals such as gold were carried down from the parent rock and deposited as a result of gravity in gravels or other debris in stream beds. These processes led to concentration. This concentration is one of the prime factors in locating producing points, for on it depend the richness and thickness of the mineral seam or vein and therefore to some degree its payable character. In each area we thus need to consider the amount and quality of the metal present in any ore bed. The cost of winning the metal depends largely on the percentage of it which is workable. The percentage which represents a workable ore varies greatly with different metals. Thus a 50 per cent. iron ore is commonly worked, and it does not usually pay to work any ore with less than 20 per cent. of iron content. On the other hand, a copper ore is rich and workable if it is a 2 per cent. ore. For economical working a coal is generally solid coal as free as possible from anything of a foreign nature. The workable percentage in each case is a relative one in relation to other deposits available.

We next consider the conditions under which the seam or ore is found. In the case of coal the cost of raising the material to the surface largely depends on the depth below the surface. It depends also in part on the time taken by the miners to reach the working face, the arrangement of the rock layers as to horizontality and amount of faulting, the quantity of water present underground necessitating pumping, and the extent to which the surface features facilitate operations. River valleys like those of the Pittsburg region, cut well down towards or below the seam, provide conditions for economical working.

We need also to take into account the space relationships of the producing area with the rest of the world. Under this head fall the distance of the producing point from that at which the material is to be used, the obstacles in the way of transporting the material to that point, the problem of getting in supplies of food and other products, particularly in such a case as that of the Kalgoorlie goldfields, the relationship with other areas of production, the probable competition to be faced, and the extent to which it is more profitable in all the circumstances to use the land for other purposes. It does not follow that all of these factors operate in any one case, but they are undoubtedly there as possibilities, and make themselves felt to a greater or lesser degree in many cases.

Structure regarded as the basis of slope is chiefly a matter of varying degrees of resistance of the materials which go to make up slope, together with the foldings and fracturings which in the past have produced a framework on which other agencies, principally climatic, have operated to produce the land forms of to-day. A discussion of these relationships would lead us far afield, and we, as students of the cultural landscape, are primarily concerned with the land forms themselves which form part of the stage on which human activities take place, rather than with the processes which gave rise to them, however interesting and important they are. To the extent that these processes have a bearing on human activities they come into the discussion later.

With structure regarded as a foundation on which constructional work is placed, we are much more intimately concerned. The depth at which bedrock is reached, the nature of such bedrock, and the character of the overlying material intimately affect structural work. Where solid bedrock of great resisting power is near the surface there is an excellent foundation on which to build. In New York the skyscrapers are keyed into the solid rock base. This rock, however, in the case of the subways caused great expense, whereas in London the tubes were built in the soft clay at a minimum of cost for such work. In Chicago, where it may be necessary to go 50 to 100 feet to reach bedrock, the cost of foundations is high. This is accentuated by the overlying waterlogged sand reached at a depth of some six feet. The nature of the foundation is even more important in the case of water-power dams, since owing to the enormous pressure which has to be supported solid foundations are essential. The lack of such foundation has caused many disastrous changes in the cultural landscape, as recently in South California and elsewhere, due to undiscovered weaknesses in the bedrock.

The effect of structure on foundations varies greatly with the character of the constructional work. In the construction of road, railway, and canal, engineers face similar problems of a less intense type. The expense of road construction, railway embankments, cuttings, and tunnels largely varies with the nature of the material and the foundation. Not only does structure affect first cost, but it plays a large part also in maintenance costs, and therefore in the supplementary forms of the cultural landscape which may have to be developed. This is seen in the work needed to keep out the onslaught of the sea on a coast consisting of materials of varying degrees of resistance. Because of this the Dublin and South-Eastern Railway for many years never paid a dividend owing to the heavy cost of maintenance on the section from Killiney to Greystones. This section was built on land made up of clay cliff and rocky promontory. Constant renewal of expensive coastal defence works and tunnels was necessitated to prevent

the railway from being washed into the sea. The Culebra mountain range presented a somewhat similar problem to the Panama Canal engineers. The Culebra cut had to be made through materials which not only freely slid down the sides and blocked the canal, but were so soft and so much out of equilibrium that they rose in the bottom of the canal under pressure from each side, thus delaying for a number of years the opening of the canal to traffic.

Of structure as the main source of soil particles and therefore indirectly of some of the chief elements of plant and animal food, we speak later under the head of soils.

Lastly, in treating of structure as an element of environment in relation to the cultural landscape, we consider it as a destructive agency expressed in the form of earth movements and volcanic activity. Probably no natural phenomenon has such a marked temporary effect on human activity as a great earthquake. Those of San Francisco and Tokio, and the earlier ones at Lisbon, Charlestown, and Port Royal, not only destroyed shelter units over large areas, but through disorganising trade and industry had pronounced effects on other units of the cultural landscape. Hardly less destructive were the great volcanic eruptions which at Mont Pelée destroyed St. Pierre, and when Krakatoa was blown to bits produced a tidal wave on the shores of Java, and at Vesuvius near the beginning of our era wiped out Herculaneum in a mud deluge. Where, as at Etna, the slopes are of great fertility, the landscape may be rapidly rebuilt if possible, at other places the destruction is permanent.

Landslides in steep and rocky mountain country, as in the Dolomites, and in water-logged clays or sands, as in the Isle of Wight or parts of Italy, also play their part in changing man's handiwork.

Climate

We have already seen that we may usefully consider climate as the chief environmental element influencing the production of materials from the crust indirectly through the agency of

plants and animals. Climate is made up of a series of elements of which the air itself, its density or pressure, its temperature, its humidity, its movement, the amount of water vapour precipitated from it in the form of rain or snow, and the seasonal changes and intensity of these elements are the chief matters to be considered. Of these in their influence on plant and animal life, and therefore on the cultural landscape produced by man, precipitation, and temperature, their seasonal changes and intensity, and the air movement, are of major effect.

It is useful to consider each element in turn in its broad effect on the cultural landscape. Taking first the air itself and its density or pressure, we note that it chiefly influences the cultural landscape through storms which may lead to destruction of the units of the cultural landscape. The air movements which produce storms are due to variations in pressure or density of the air, causing a rapid flow from regions of high pressure to those of lower pressure. A detailed analysis of such movements is beyond our scope. They vary greatly in intensity and area covered, from the narrow house-destroying path of a Kansas tornado to a great gale which may cover the whole of the British Isles. Air movements may destroy crops through simple lodgment. A West Indian cyclone may destroy coconut or banana plantations. The liability to storms on our coasts forces the construction of costly coast defence works at harbours and on lines of communication and settlement points. Storms endanger ships and cause transport delays.

Differences in air-pressure are the main cause of the wind systems of the world. They affect human activity in a variety of ways. Through their movement moisture is carried to the land with marked results on the possibilities of vegetable growth and the related cultural landscapes. Air movement from the land produces in many cases desert or semi-arid conditions limiting settlement. Trade and other regular winds affect the routes of sailing ships and to some extent of steamers. The wind systems produce in the main the great ocean currents, which, in combination with them, influence the

temperature conditions of adjacent land areas and ship movement. Rapid wind movement produces excessive evaporation which may limit tree growth as in northern lands. In a few places the air is so rarefied as to prevent or seriously modify human activity. This is found in parts of Peru and on Mount Everest.

Temperature, apart from its influence on air movements through producing differential pressures, has marked effects on the landscape of cultivation. It restricts the growing period, thus determining either the absolute or the profitable limits of certain useful plants. The northern limits of maize and cotton are thus fixed in the United States. The chief element of temperature operating in these cases is frost. Unless there is an adequate growing period free from killing frost the young plants may be killed or the harvest seriously affected. The effects of frost are seen to an even greater degree in the case of citrus fruits in Spain, Italy, Florida, and California. Temperature also has a marked effect on seed germination, the seed of the cotton plant usually refusing to germinate below 60° F.[1] Temperature limits growth by promoting or retarding evaporation and so reducing or increasing the amount of water in the soil available for plants. Thus a rainfall adequate for cultivation in North Dakota is insufficient in Texas through evaporation produced by temperature. The development of the landscape of tillage may thus be prevented in a region otherwise suitable. Indirectly its effect on soils through causing, in conjunction with other factors, the breakdown of rock particles, may produce or prevent cultivation. Frost may interfere with the development of the landscape of transportation as in eastern Europe or the Great Lakes region, or as in the case of the proposed Hudson Bay route, and, as on the Ohio, it may seriously damage transport vehicles through ice movements. Snow blocks traffic routes, rendering necessary the snow plough and snow shed. Snow and ice coupled with

[1] Smith, J. W., *Agricultural Meteorology*. The zero point of plant growth seems to be 43° F. Zero point of vital temperature for growth varies with different plants above this point.

other factors give us the landscape of winter sports in Switzerland and elsewhere.

The amount of water vapour present in and precipitated from the atmosphere, chiefly in the form of rain, may markedly affect the landscape of cultivation. Rainfall coupled with temperature is usually the deciding factor between grassland and tillage, and between grassland and desert. Thus on rainfall as a prime factor depend the cultural landscapes of the desert, the grassland, and the regions of cultivation. The chief difference between the tropical grassland and the tropical forest is a matter of rainfall, with corresponding effects on the cultural landscapes modified by other factors. The seasonal monsoonal rains of the Far East are in many areas sufficiently heavy to give forest instead of grassland. The typical forest settlements of eastern Europe and the logging camps of North America, are mainly an expression of the rainfall factor. Rainfall plus temperature gives the deciduous forest areas of much of the world. What is mainly involved in these cases is the amount of water available for plants during the growing season. We are concerned both with the total quantity and seasonal distribution of the rain, together with those factors which cause an increase or decrease in the ground water volume, temperature as we have seen being one of these. In regions of deficient rainfall, tree growth may still be possible along the river valleys, as in western U.S.A. and south-eastern Russia. Rainfall also influences the type of crop grown, and thus the characteristic appearance of the cultural landscape. Owing to the varying demands of the two plants on the water in the soil, a rainfall of about 15 inches, which may be quite adequate for wheat, may prove, other things being equal, insufficient for the much bulkier maize plant, which may require 30 or 40 inches for full development. Variations in the quantity of rain falling during the growing period may increase or decrease the volume of the crop, thus affecting the price at which it is sold, which in its turn influences the character of the cultural landscapes of that and other crops in the succeeding year. Heavy rain may also have a marked

effect on crops through lodgment, reducing the yield, and affecting the area sown in other seasons. The effect of seasonal rainfall on crops is well shown in the case of the Corn Belt, where the month of July is the critical one from the rainfall standpoint. (See *North America*, Jones and Bryan.)

Rainfall coupled with other factors such as slope, chiefly determines the amount of irrigation possible in adjacent regions. It also influences the siting of hydro-electric stations. In the form of flooded rivers it may cause serious damage to, and perhaps permanent changes in, the face of existing cultural landscades. In such areas as the English Midlands it, in combination with slope, limits the possibilities of canal development.

In combination with high temperature, excessive rainfall leads to the growth of stem and leaf at the expense of fruit. Tropical luxuriance is thus mainly a matter of stem and leaf with a minimum of fruiting capacity. It is thus an important factor in plantation agriculture. This combination tends also to limit grain production, as in Georgia, where the yield of wheat per acre is so low that it is only possible to grow it for local consumption. In such regions the typical cultural landscape of wheat production is unlikely to develop to any extent.

The relative humidity, that is, the percentage of water vapour present in the atmosphere at any given temperature, may be a deciding factor in the landscape of cultivation. Thus the cultivation of coffee on the Arabian slopes is thought to be possible only because of the mists rolling up from the Red Sea, which are due to the high relative humidity of the air. The high relative humidity of tropical regions has a very debilitating effect on man, and in part may even be the cause of the low state of cultural development of tropical races.

Seasonal changes we have referred to above under the separate elements, where the effects of wind, rainfall, and temperature have been touched on in relation to the cultural landscapes of transport and agriculture.

In the above brief survey it has only been possible to touch lightly on some of the chief ways in which each of the elements of climate affect the forms of the cultural landscape. Anything approaching a detailed exposition would require a book to itself. We may here, however, briefly consider some of the steps taken to modify the effects of climate on the cultural landscape. These mostly take the form of efforts to predict weather conditions, and to notify those likely to be affected of impending changes. The weather bureaux set up in Great Britain, India, Australia, the United States, and Canada represent some of the chief developments along this line. In Great Britain, weather forecasts are broadcast daily for farmers. These have proved of great value in enabling farmers to select the best times for harvesting operations. There is reason to believe that since the introduction of broadcasting, standing crops have been saved through this agency which would otherwise have been lost with corresponding effects on the cultural landscape. In North America, where a similar service is highly developed, warnings of the approach of storms, of frost in the citrus fruit regions of Florida and in the northern wheat areas, of rain in regions where dried fruits are being prepared, of flood waters along certain rivers, and of snowstorms to cities, enable the necessary steps to be taken to reduce to a minimum the damage to the features of the cultural landscape. To fishermen and sailors around the stormy coasts of the British Isles, gale warnings are issued. Land traffic is cared for by the periodical Automobile Association reports of road conditions as affected by flood, fog, snow, or ice. Thus man takes such steps as he can to nullify the detrimental, and to take advantage of the favourable, climatic conditions as affecting his activity, and thus affecting the forms of the cultural landscape.

Slope

Slope as an element in natural environment affects the cultural landscape in many ways. The location of settlements, as in the case of defensive and other sites, is partly

governed by slope. Slope influences the cultural landscape of transport by conditioning lines of movement and forcing the construction of embankments, bridges, and other structures to avoid obstacles. It limits areas of cultivation. On steep slopes it is difficult to use machinery for cultivation. Steep slope also causes excessive soil wash. Direction of slope modifies the amount of heat and moisture reaching certain areas. It thus limits types and yield of crops. It also modifies the drainage, and thus the character and volume of cultivation. Lastly, man finds it difficult to utilise very steep slopes. On such the natural landscape tends to persist, though near it the cultural landscape of sport and recreation may develop.

The surface of the earth is made up of varying degrees and combinations of slope. Few, if any, parts of the surface are perfectly level. There are certain combinations or types of slope which tend to repeat themselves over and over again. The uniformity of these combinations is reflected to some extent in a certain uniformity of the forms of the cultural landscape which develop within any one combination or zone. Hence, some have taken topography as the major guide for a classification of natural units.

These types of slope or land forms may be broadly classified as follows:

1. *Level or Nearly Level Plains.*—In them movement in every direction and settlement are easy. The cultural landscape is commonly either that of tillage or pasture, the choice depending mainly on soil, drainage, and suitable climatic conditions. Where structural conditions are favourable, these areas become centres of manufacturing activity. In such areas the needed communication links can be built and maintained very cheaply. The Black Earth region, the south-eastern steppes of Russia, and the plain of Cheshire are examples.

2. *Undulating Lowlands.*—In many respects this type is similar to the preceding. It differs from it in possessing better drainage. This makes it more suitable for tillage. Owing also to the air drainage, the slopes are particularly

favourable to fruit culture, so that in many areas of this type the orchard becomes an important element of the landscape. Orchards also develop in the level plains where sufficiently removed from high ground to render air drainage negligible.[1] The steeper parts of the undulating lowlands, especially where the thunderstorm type of rainfall is frequent, may suffer severely from soil wash. This is particularly marked where the vegetation cover is destroyed through lumbering or other activity, but it is also found where natural grass has been removed for tillage. A recent writer [1] ventures the opinion that in U.S.A. some 40 per cent. to 50 per cent. of the tilled land has suffered from soil erosion, and that about one-fourth of this has suffered serious damage. The winding character of the cultural landscape of transport in the undulating lowlands offers a marked contrast to the straight-line type of transport development which tends to occur in the level plains.

3. *Hill Country.*—Hill country may be regarded from our point of view as country in which the slopes are for the most part of such a character as to make tillage difficult, so much so that grazing tends to predominate. Grass helps to hold the soil particles together and prevent soil wash. The altitude in such regions is not sufficient to prevent cultivation, hence on the gentler slopes and flatter summits agriculture, other things being equal, is found, but occupies as a rule a smaller percentage of the total area than in plains or undulating lowlands. On the lower slopes in hill country, orchards may be prominent, and terracing, as for vines in south Germany, or rice in Japan, gives distinctive appearances to the cultural landscape. Settlements tend to concentrate in the valleys to a marked extent.

4. *Mountain Country.*—Here the slopes are so steep and the altitude so great as to prohibit cultivation except in the valleys. Where soil and slope permit, excellent grazing may be had, so that the cultural landscape in the mountains tends to occupy a relatively small percentage of the total area, and to be of a definitely pastoral type, when it is not connected

[1] See Chapter 10.

with the winning of materials directly from the crust. A supplementary form of cultural landscape is that of tourist resorts and forest reserves.

In the mountain valleys, aspect becomes of great importance, so that in the northern parts of the French Alps the settlements tend to be on the south side of the valleys, while the reverse is the case in the valleys of the southern Alps.

5. *The Plateaux.*—A plateau is perhaps best considered as a plain at an altitude of from 2,000 to 15,000 feet above sea-level. Such a figure is more or less arbitrary. Since the surrounding mountains of many plateaux tend to cut off rain, the typical plateaux like those of Abyssinia, Bolivia, Spain, or Mexico are rather dry. Hence irrigation, grazing, and specialised lines of communication caused by the mountains and deeply cut river valleys, are forms of the cultural landscape. Where mineral deposits are found, as in the Bolivian and Rocky Mountain plateaux, mining settlements form characteristic features of the landscape.

6. *The River Valley.*—River valleys of many types are found in connection with all the above areas. The river valley is by some regarded as the main geographical unit. As it generally facilitates movement, it is intimately connected with lines of settlement and movement. It is separately discussed later.

In the lowlands and river valleys the cultural landscape has replaced to the greatest extent the natural landscape. It is in mountains and plateaux that the largest areas remain under the natural cover. There are certain obvious exceptions, based mostly on soils and drainage, such as the marshlands and sandy heathlands of the north German lowlands, the regions of extensive forest cover, as in Russia or northern Canada, and the marshlands of the Tundra. Lack of rain produces the great lowland desert regions.

It is not proposed to analyse in detail all the above types. It is, however, desirable to examine in greater detail the lowlands because of their relatively greater importance from the standpoint of man. A series of subdivisions is therefore

suggested here, based mainly on the character, or rather origins, of the materials forming the surface, since on these chiefly depend the soils, drainage, and the effect on the cultural landscape.

The materials forming the surface to-day are due either to weathering *in situ*, which breaks down the rocks of which the surface is composed, or to the transportation of materials from other areas through the action of water, ice, or wind. It may also be due to both of the above processes in varying degrees. On this basis we can distinguish among others the series of subdivisions of the lowlands which follow.

1. *Residual Plains or Lowlands.*—Through the action of heat and cold, frost and ice, wind and rain, oxidation and hydration, chemical processes of solution, and the work of plants and animals, the bedrock of most areas is slowly disintegrating. Where this is so there is a direct relationship between the underlying rock and the soil. As in the Weald, where many rock outcrops are found in parallel zones, there is commonly a great variety of surface soils, each of which tends either to prevent, or to be related to different human activities. There is in such areas close at hand a great variety of cultural landscapes. In a relatively short walk north and south of Midhurst, in the Weald, some seven or eight different rock outcrops are crossed over, each of which presents a different cultural landscape. Similar examples are found in connection with many escarpment slopes.

2. *Piedmont Alluvial Plains.*—Most of the world's lowlands are surfaced not with residual material, but with material brought from a distance through river, ice, or wind action. Where rivers emerge abruptly from mountain or hill country they throw down the heavier parts of their load, and tend sometimes to lose themselves in the debris thus accumulated. Alluvial fans are thus formed. Such fans may merge to make undulating lowlands or terraces of coarse material. This is particularly so in semi-arid regions like that along the foot of the Wasatch Range in Utah, and the Sierra Nevada in California, where the streams are intermittent in flow. Such

areas tend to develop the cultural landscape of irrigation based on wells and water brought from nearby mountains. The region of the 'curtain of the mountains' in Asia offers many modified examples of this type.

3. *Alluvial Plains.*—This term may be usefully applied to many lowland areas such as the Indo-Gangetic Plain, the plain of Hungary, the plains of South Russia, and the Pampas. These were built up in past ages out of materials carried down from higher levels by rivers, and spread out in sheets of varying kinds of material, more or less sorted, over the surface of the lowlands. They are mostly regions of rich alluvium, fairly well drained, and therefore suitable for cultivation. The character of the tillage mainly depends on climatic factors, while the detailed distribution of the cultivated areas and their minor characteristics depend on the differences in material and the drainage.

4. *Flood Plains.*—Set in the alluvial lowlands are the flood plains of the rivers which now cross them. In flood the rivers may fill these plains. Annually fresh supplies of fertile silt are then spread out over the surface. These plains, as a rule, except under highly specialised conditions, as in the *hortillons* of the Somme, are not cultivated, though they may be extraordinarily fertile. Parts of these flood plains, as along the Mississippi, are occupied by marshlands, but where drained and defences in the shape of levees or artificial embankments are constructed to regulate the flooding in volume and in season, the natural landscape disappears to give place to one of high cultivation. Some of the richest lands of the world are the fertile bottomlands of the Illinois. The Nile flood plain in Egypt is a well-known example. Near large centres of population the flood plain is a favourable milieu for dairying.

Strips of higher land at the edge of the flood plain, particularly where undercut by the river, form excellent sites for settlements. Baton Rouge or Vicksburg may be cited. The width of such flood plains makes crossing difficult and bridges expensive. Where bridges are built, as at Keokuk in Iowa, they form striking elements of the cultural landscape.

Closely linked to these flood plains are the deltas of large rivers. In Egypt, and along the east coast of India, they give rise to a specialised landscape of irrigation, with its barrages to raise the water level, its main and subsidiary channels for water distribution, and its low embankments separating the cultivated plots.

5. *Recently Formed Coastal Plains.*—These are areas of the coasts of continents, the areas being comparatively recently raised above sea-level. They are of two main types. The coastal plain along the east side of India and the Gulf Coastal plain of the U.S.A. form one type. The lowlands of Holland and parts of Belgium, which within historic times have been reclaimed from below sea-level by man's dykes and embankments, form another type. The first type consists largely of sandy and other coarse sediments deposited near ancient coast lines. They sometimes carry, as in Louisiana and the Atlantic coastal plain, extensive pine forests. They are commonly fringed by marshes, sand dunes, and sandy spits. Under favourable conditions they exhibit on their margins the cultural landscape of seaside resorts and recreational activities, such as golf courses and bathing beaches. On these coastal plains the deltas of large rivers frequently superimpose the flood plain type of region discussed above. The warm, sandy soils near large centres are especially suited for the cultivation of vegetables, and market gardening in general, and the patches of fertile alluvium brought to them by the rivers may be highly tilled.

6. *Bare Rock or Ice Scoured Lowlands.*—Ice, as a transporting medium, has produced four main types of lowland country. These are the ice-scoured areas, the rough morainic regions, the boulder clay or till plains, and the lake plains. All four were at some stage or other during the glacial period covered by ice sheets. The great bulk of the pre-ice soil cover was removed by the ice sheets leaving the bare rock areas which fall under this head. Such areas, though frequently of slight relief, are made up of a series of very irregular minor slopes. Numerous lake basins, outcrops of bare rock, and patches of

soil in the depressions, with as a rule a dense growth of mixed deciduous and coniferous forest, coupled with a network of streamways interlacing all over the area, form the more characteristic units. In many such areas, as in eastern Canada and Finland, the natural landscape is largely untouched, the relative absence of soil and the severity of the climate being unconducive to human activity. The irregularity of the surface hampers farming operations. In the more fertile patches, the landscape of mixed farming based on hardy crops and dairying has developed, while in isolated spots the landscapes of logging and water power for sawing timber and making wood pulp are establishing a foothold. Here and there small mining centres and scattered trappers' huts are found. Mostly in the summer, on the margins of the area, recreational resorts and related activities are appearing. By far the greater part of all such areas to-day is dominated by the natural rather than the cultural landscape.

7. *Boulder Clay or Till Lowlands.*—From ice-scoured lowlands the ice sheets swept the loose soil in a general southward direction. It was deposited when they melted and retreated northward. In this fashion soil, varying from a few feet to a couple of hundred feet, was spread out fairly evenly over the surface covering up the pre-ice irregularities. The great plains of western Canada and the Corn Belt have been so produced. Patches were subsequently covered by loess, a wind-borne material, which has added fertility to the parts thus covered. Such loessic areas in Europe are discussed later. The soils thus laid down by the ice vary greatly in character from place to place. On the whole they are suitable, as are the other factors of the physical setting, for cultivation. The cultural landscape of farming therefore covers the greater part of these areas, and only a relatively small proportion of natural landscape exists. This type therefore offers a great contrast to the ice-scoured lowlands in its effects on the cultural landscape.

8. *Lake Plains.*—Closely linked to the formation of the foregoing are the lake plains. They were mostly formed on

the edges of the great ice sheets as they retreated northward. The presence of the irregular edges of these sheets to the north, and the morainic deposits to south, led, where circumstances were favourable, to extensive flooding. Lakes were thus created along the edge of the ice sheets. Into these lakes numerous rivers carried silt from neighbouring areas. When the water drained away with the disappearance of the ice, great stretches of fertile lake bed were left exposed. Lake Agassiz in North America is a familiar example. It occupied the region which is now part of Manitoba and the Red River valley. It is to-day one of the greatest of the world's wheat producing regions. In places the old lake floor is still marshy. In places it is poor, sandy material, where currents in the old lake carried the coarser sediments, but for the most part it is occupied by the cultural landscape of wheat farming. Smaller lake plains may develop apart from ice action through drainage either artificial or natural. They are found in many parts of the world. Where climatic conditions are favourable they exhibit similar features.

9. *Rough Morainic Lowlands.*—These are mainly found scattered about on the boulder-clay plains or on the margins of the lake plains. They are areas covered by terminal or other rough morainic deposits at points where the ice front paused in its movement. They are commonly pasture lands to-day, as their rougher surfaces and poorer soils seldom make them as suitable for tillage as the till plains in which they are found.

10. *Loess Plains.*—In many parts of the world there are areas of great fertility due to the deposition of fine material carried from a distance by the wind. Probably the best example of this type of lowland is found in China, where the north-west winds from the Mongolian desert have carried down through the centuries immense quantities of fine material to northern China, burying the pre-existing topography. An interesting account of this region is given by Richtofen. Its major drawback in China is the lack of adequate rain. Such regions in Europe appear to be closely related to the early

development of agriculture in that continent. La Blache gives an effective map of these areas in Europe. Many prehistoric sites and remains have been discovered in connection with some of the well-known regions, as in Alsace, the Breslau area, and Rhenish Hesse, indicating regions of very ancient cultivation.[1] The soil was fertile, easily worked with primitive implements, and free from forest cover or marsh. Much of northern France has been modified by depositions of this type, and to a lesser degree parts of the North American prairies.

11. *The River Valley.*—It would be possible to distinguish many other minor combinations of slope and surface material, but here we only touch on one. The river valley is a type of slope combination which is found in connection with, and is intimately related to, all those we have examined. Usually the line of easiest movement in an area, we see focused on it an epitome of the life of each of the regions it passes through. With its tributary valleys it forms a series of tentacles which spread out into the adjacent areas, and tend to tie the life of these areas to the major stem. It thus links the mountain and hill country to the lowlands. Only in the plateau country, where it is commonly so deeply sunken below the surface as to be useless for settlement or movement, or in the prairie country, where its major influence belongs in the past, does it fail to perform this function of link. In crossing many different types of cultural landscape with varying products, it forms the natural line along which movement and exchange of products take place. At the end of most river valleys is the great highway of the sea which carries the products through the process of exchange to other countries of differing activities and products. At its mouth, and along its valley, in varying degrees of intensity, grow up all those many forms of the cultural landscape connected with movement, exchange, and administration. Few more suitable sites for great centres of administration and capitals like London or Paris, exist than

[1] Professor Fleure has pointed out that one of the most important and least known of these areas is the Basin of Mainz, in which many of the most valuable discoveries throwing light on prehistoric conditions have been made.

at points of maximum concentration of population in the river valley. In new countries such valleys as that of the River Nene to the Saxons, and the St. Lawrence to the French, offer the easiest lines of movement. On the valley sides, on or near the river, grow up the first settlements. Other forms of the cultural landscape appear as the natural one disappears in process of man's adaptation of nature to satisfy his wants.

It is for these, among other reasons, that to many the river valley, with suitable subdivisions based on climate, slope, soil, drainage, and organic life, offers, in many areas, in our present state of geographical knowledge, the nearest approach to a truly geographical region. In it there is a diversity of products, and a diversity of activities, which, none the less, give an essential unity and balance to the whole.

We have seen above that one can analyse separately the different kinds of land forms which form part of natural environment. We have also seen that the mountains, the plateaux, the foothills, the varied types of lowlands, each contains a particular form of cultural landscape which is the expression of the relationship between man and his environment in that area. The whole needs linking. The essential link in modern life is transportation. The natural lines of movement follow the river valley in most areas. Exchange is to-day one of the basic facts of human activity, since economic life is organised on the basis of exchange of surpluses. The river valley is the main natural feature on land providing that link; hence its importance to us, if we are to maintain in our geographical studies that wholeness of outlook which is of their very essence.

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Chapter 6

THE ELEMENTS OF THE NATURAL ENVIRONMENTAL COMPLEX (*continued*)

Soils, drainage, vegetable and animal life. The natural region is a complex combination of the elements of the environmental complex. A new system of classification for the natural and cultural subdivisions of a region as applied to the Leicester Region.

SOILS

SOILS viewed as an element of the natural environment are a product of structure, slope, and climate, together with the natural vegetation, the degree of cultivation, the methods of cultivation, and the time period during which the whole process has been going on. Climatic conditions coupled with slope break down the rock crust to form a more or less loose medium in which plant roots can spread and develop. Natural vegetation causes further changes through root action and decay. Still further changes are brought about by the processes of tilling the soil and adding to or taking from the characteristics which it already possesses. The net result is the present soil condition of any area.

From the standpoint of effect on plant life, soil conditions may be briefly considered under four main heads. They are: the physical texture or condition; the amount of plant food present and available; the depth of the soil; and its temperature.

Physical Condition.—The physical condition of soil varies with the climate of the area, the materials of which it is composed, and the processes which have produced it. There are four main kinds of materials which go to make soils. Sandy material is derived mostly from sandstones, schists, and quartzites. Such material is markedly deficient in plant food,

but, owing to its relative coarseness, produces a certain desirable looseness in which the roots of plants can move freely. Clay material is derived from such rocks as shales, granites, and gneisses. It tends to be very fine and close-grained, and, unless relieved by the presence of other materials, is rather sticky and difficult to cultivate. It also hampers the free development of plant roots. Lime in its various forms is mostly derived from limestone and chalk rocks. It tends to lighten the texture of most soils. Organic matter in the form of decayed vegetation or humus also lightens the texture of soils and supplies important elements of plant food. The amount of water and air present in soils has a marked effect on the texture of the soil, and on the availability of the plant food present, water being the medium through which the elements of plant food pass to the roots of the plant. Both air and water facilitate the action of soil bacteria which help to prepare the food elements for consumption by the plant. Either an excess or a deficiency of water modifies the yield of plants. Loose-textured soils tend to be very permeable and therefore do not retain moisture, while close-textured soils, such as those in which clay predominates, are relatively impermeable, and become waterlogged—a condition favouring certain kinds of plant growth as against others. Very fine loose surface tilth produced by hoeing or harrowing, helps to retain moisture which would otherwise be lost by capillary action. Other things being equal, excess of moisture in the soil favours the growth of leaf and stem, while dry conditions help the production of seed. Wet soils thus aid the growth of grasses while relatively dry soils favour that of grain crops, with the appropriate cultural landscapes. The contrast is well shown between light soils of the loessic type and the heavy alluviums of such a valley as the Soar in Leicestershire.

Plant Foods.—The principal plant foods in soils are the so-called 'golden tripod,' consisting of nitrates, phosphates, and potash. Lesser food elements are lime, sulphur, magnesia, and iron. The last three are usually present in abundance in most soils. On nitrates, phosphates, and potash the weight of

crop largely depends. Lime is a common constituent of both light and heavy soils. It sweetens soils and helps to neutralise the acid condition resulting from excessive manuring. Nitrates, phosphates, and to a lesser extent potash, are either deficient or rapidly becoming so in most soils. Nitrates promote the growth of leaf and stem, phosphates the production of flower and fruit, while potash assists the process of the assimilation of plant food, and appears to aid in maintaining the general health conditions of the plant. As nitrates and phosphates, and, to a lesser degree, potash are rapidly removed by growing crops, they must be replaced if soil fertility is to be maintained. Various practices are adopted to maintain this fertility. Fallowing, the process of allowing the land to lie idle for a time, leads to increase in water content and plant food. Rotation of crops also so operates, since certain leguminous crops introduced in a rotation system increase the nitrogenous content of the soil. Green manuring, that is, the practice of ploughing in a green crop, particularly of the leguminous type like mustard, increases the nitrogenous content, and also the amount of humus present. This both adds to the plant food available and improves the soil texture. Animal manure in its many forms contains chiefly nitrogen, and to a lesser degree phosphates, hence the practice of folding sheep on arable land. Lastly, artificial fertiliser containing the elements of plant food in suitable proportions, can be added to the land, and increases the plant food content, though it fails in most cases to improve, as do animal manures, the physical texture and water-holding capacity of soils. While discussing the plant foods in soils we may briefly refer to certain elements which are detrimental to plant life if they are present in sufficient quantities. Most metallic salts interfere with the process whereby plants assimilate food, and are therefore injurious to plant life if found to excess in soils. What constitutes excess varies with the salt, the plant, and the general soil conditions. Such salts are readily carried away where drainage is adequate. Where inadequate, and/or where irrigation water containing salts is used to excess, the condition

known as alkali is produced, resulting in plant starvation although food may be present in abundance in the soil. Acid conditions of soil, which may be due to an excess of animal manure, as in old garden soils, are also detrimental to plant life. They may be corrected by suitable applications of lime.

Depth of Soil.—The growth of a plant above ground depends in large measure on its development below the surface, hence the depth of the soil, in other words the root run, is a matter of great importance. Such a plant as a sweet pea grows six or eight feet tall, and requires deep trenching to get adequate root run. This root run is limited under natural conditions in three main ways. These are the actual depth to solid rock or to such coarse material as cannot be easily penetrated by plant roots ; the development of a hard layer in the soil, commonly called hardpan or claypan, through which the roots of the plant fail to penetrate, as in the western part of the American Corn Belt ; and lastly the waterlogging of the soil below a certain depth, particularly if charged with salts, as in the irrigated delta of the Nile. This question of soil depth is closely related to the conditions under which the soil was formed. Sir John Russell in a recent paper has shown that the variation in character and depth of some of the chief Russian soils depends on the climatic conditions related to their formation. Thus in the Black Earth zone the deep rich soils are somewhat similar to those of the Corn Belt. They developed under moderate rainfall conditions sufficient to promote the rapid growth of grass, without undue leaching of the soils between periods of growth. The accumulated plant roots give a rich nitrogenous content to these soils and a great depth of soil humus. To north of them the Podzol or forest soils have lost much of their fertility through the action of tree roots and also through leaching in regions of heavier rainfall. To south-east of the black earth soils, the grey soils of the steppes lack plant food and are very shallow, hardpan forming in the conditions of light rainfall and underlying carbonates, close to the surface. The most favourable conditions for the formation of rich soils appear

to be in regions where the rainfall is moderate and distinctly seasonal. In such regions tree growth is checked, grass predominates, and the plant foods are not leached from the soil. Hardpan can be broken in some regions, as in India, where a suitable plant can be found having the power to break it up by strong root action [1].

Temperature.—The temperature of a soil depends on the physical texture, the colour and slope of the soil, its aspect, and the climate. Wet soils, clay soils, and light-coloured sandy soils, tend to be cold. Dry soils, sandy soils, and dark-coloured soils, tend to be warm. Land sloping south is warmer than land sloping north, other things being equal, and therefore grows earlier and perhaps heavier crops.

Soils from the standpoint of their effects on human activity may be classified in many different ways. A useful classification is that which is based on the physical composition, taking sand and clay as the two chief physical constituents with lime and humus as lesser ones. Such a classification is particularly useful from the standpoint of British soils. On this basis we can recognise five major, and one important minor, divisions. Taking first the five major, and regarding a 40 to 60 per cent. mixture of sand or clay in either direction as a loam, we have on the one side two classes in which sand predominates, and on the other two classes in which clay predominates. Our minor division is one which has a relatively high percentage of lime, and is for that reason best classed as a marl.

1. *Very Light Sandy or Gravelly Soil.*—Such a soil may be regarded as having over 80 per cent. of sand or gravel. Such soils are mostly uncultivated, as they do not pay to work. They are to-day covered with heathland and other wasteland. Many of the greensands, the Bagshot beds and patches of glacial gravel and sand such as Bagshot Heath, Amersham Common, and Wimbledon Common produce such soils.

2. *Light Sandy Loams.*—These contain about 60 to 80 per cent. of sand. They may be sandy or chalky soils on the greensands or chalks. They are warm, easily worked by hand, and, near large centres of population, are extensively worked as

market-garden soils. They lack humus, and do not retain water well, but their other advantages are such that it pays to add manure to them. Where used for barley or other grains, as on the Downs, it is a common practice to fold sheep on them to improve the fertility and the water-holding capacity.[1] The limestone lands of Lincolnshire and some of the lighter Norfolk soils are excellent examples.

3. *Loams.*—These contain a fairly well-balanced mixture of sand and clay together with humus and lime. They retain sufficient moisture for crops, and they are relatively rich in plant food. Such soils will grow almost anything not ruled out by climate. They are among the best soils in Great Britain, and one of the finest examples of this type is the marl terrace along the north edge of the South Downs—a splendid wheat soil.

4. *Clay Loams.*—These soils are heavy, but are rich in plant food. Where well-drained, as in the southern part of the Oxford clay plain, they form splendid wheat lands ; but where, as on the lias of Leicestershire, they tend to be waterlogged, they form excellent pasture lands. They contain usually from 60 to 80 per cent. of clay. The waterlogging may be due to slope or rainfall or both.

5. *Heavy Clays.*—These soils may have 80 per cent. of clay. They are usually too wet or heavy or both to pay for clearing, so they are either waste woodlands or marshlands, such as the patches to be found on parts of the Gault in the Weald. On them the natural landscape remains largely untouched, except where cut out for firing, and where gamekeepers', woodcutters', and fowlers' huts have been erected.

Lastly come the marls already referred to above. They may fall into several of the classes already mentioned, but mostly come under the head of loams.

Soils may be classified under other heads, on a basis of climatic, or vegetable, or other origin. Thus tropical soils, desert soils, and temperate soils possess marked characteristics,

[1] The sheep also " work " the soil with their hooves, hence the term "Golden Hoof " as applied to sheep in this method of farming.

as do also loess—a wind-formed soil—forest soils, and grassland soils. We touch on this point in the chapter on the Corn Belt, and we have referred above to the influence of climate on Russian soils. The main factor in the origin of soils appears to be climate; minor factors are physical character of the particles and the plant food present. Further discussion of soil origin would take us beyond our scope. We have endeavoured to bring out some of the varying ways in which soils affect human activity and consequently the cultural landscape.

While climatic conditions have not so far been altered to any extent by man, soil is much more under his control. Many British soils have been altered through the processes of cultivation until their natural characteristics have been markedly modified. Little if any soil in Britain, except in the grasslands, is in its original natural condition. The original soils of the Channel Islands, for example, were very poor. Through careful cultivation over long periods of time, and the addition of fertiliser, these soils now produce crops which are incredible in size if we are thinking in terms of the original soil conditions.

In conclusion it may be stated that while climate is a major factor in determining the cultivation of the land surface, soils and slope are minor factors affecting the specific areas cultivated, the weight of crop produced, or the carrying capacity of the land in terms of livestock units.

Drainage

Drainage as an element in the natural landscape may be examined under two main heads. The first is its relation to soils from the standpoint of cultivation; the second, its relationship in the form of springs to sites for settlement. Such a discussion can be expanded to cover irrigation, water-power, and transport, each of which is related to drainage in the wide sense of the term (see separate section on Water Areas and that on Rainfall). In relation to soils, drainage is chiefly affected by the permeability or impermeability of the soils, their capacity to hold water, or to rid themselves of water, for

these affect the character of that which the soil produces. Water-holding capacity is largely a matter of slope and nature of the soil. The character of the Black Cotton Soil of the Deccan is such that it is very tenacious of moisture. A chalk or limestone soil may have little or no water-holding capacity. The limestone of central Ireland forms an exception since it lies not far above sea-level. Humus or animal manures added to soils increase their water-holding capacities. Artificial drainage through pipes and tiles is employed to improve cultivation in many areas.

Underground drainage determines lines of settlement mainly through its effect on water output and spring lines. Many lines of villages coincide with lines of juncture of permeable and impermeable strata. Here, if the water table lies at or above the line of juncture a spring line develops. Excellent examples are the village lines based on springs at the foot of the Chilterns or the north edge of Salisbury Plain, or that of the North Downs chalk.

Normal land drainage is intimately related to the solution of the pressing problem of water supply which every great city has to face to-day. The map of the Pennines in the vicinity of the Lancashire cotton or Yorkshire woollen towns shows the edge studded with reservoirs supplying the towns below. Great reservoirs in the Welsh mountains and the Lake District have been constructed to serve the pressing needs of the Midland and Lancashire cities.

Vegetable and Animal Life

No survey, however brief, of the elements of natural environment, would be complete without some reference, however slight, to the part played by organic life. Organic life so far as structure is concerned, is largely the product of the foregoing elements, but in itself it forms an element of the physical setting. Where a cultural landscape develops, the forms of that landscape in large measure replace the vegetable and animal covering. Thus natural vegetation is replaced by crops and tended grassland. Cultivated plants represent,

in a sense, a development of, rather than a replacement of, forms of natural vegetation. The existence of certain types of natural plants, as in the case of wheat, led to the production of our cultivated plants. The natural forms most useful to man have been taken and developed to a point where they show great improvement on the originals. A few such forms now largely replace in some areas the many of the original natural cover.

Then, as has been admirably shown by Dr. Vaughan Cornish, in the *Poetic Impression of Natural Scenery*, certain combinations of elements produce beautiful scenic effects, and the effort to enjoy and view these has led to the cultural landscape of the tourist industry in such regions as Switzerland, the English Lake District, and the Highlands of Scotland.

Some types of vegetation and to a lesser degree of animal life, have a distinctly negative effect by preventing the development of the cultural landscape. Thus dense forest growth, impenetrable bamboo thickets, the stinging nettle of the Parc Albert, the presence of dangerous wild animals, and in the past of tribes of even more dangerous men, have all prevented the development of the cultural landscape. Man can remove these obstructions to settlement, but the effort required to do so is often out of all proportion to the results that would accrue at present.

Insect plagues such as locusts, and pests which attack his crops, come under the same category, but these are usually combated since they threaten the forms of the existing cultural landscape and force man in self-defence to take such steps as he can to prevent their destructive effects. In East Africa at present the locust problem is giving much trouble, and campaigns are being organised to free the settlers from this troublesome plague.

Water Areas

These have been incidentally touched on in connection with the elements dealt with above. There are four main types of water areas. They are ponds, lakes, rivers, and the

sea. Ponds, lakes, and rivers are land surface units. They are links in the chain of water circulation, in which water evaporated from the surface of the sea is lifted into the air, carried by the winds to the land, is condensed, and falls as rain to fill rivers, ponds, and lakes and ultimately return to the sea. Ponds serve as minor sources of water supply for industrial purposes, as drinking places for livestock, and sources of energy for small water-power plants. Lakes are chiefly used for transport and as sources of water power. Rivers are the great arteries of the land which carry the water back to the sea. They serve as means of transport in many areas where they are navigable, and they are the backbone of the river valley and all that that implies as previously discussed. The seas of the world separate continental and insular areas, and at the same time with the development of adequate means of transportation they are the major link between these areas and provide the cheapest means of transportation yet developed by man. On their margins have developed the great terminal ports of the world, and on their tidal effects depends much of the transportation penetration of many lands. On these tidal rises and falls may yet depend the most reliable of all man's sources of energy—tidal power.

In the above analysis we have indicated some of the more salient ways in which the elements of the natural environment effect the cultural landscape. It is apparent from the analysis of the elements that they seldom operate alone, but in conjunction with others. It is apparent also that, with the exceptions of structure and climate, each element is the result of a combination of other elements. This is true to some extent even of climate. Climate in relation to structure gives us land forms or slopes. Slope in relation to climate and most of the other factors in varying degrees produces soils. Drainage is a product of all the foregoing together with vegetation. Vegetation is itself a product of all the others blending in various degrees. Any geographical feature, or district, or region, is the result of a highly complex combination of the different elements blending in various proportions.

It is thus interesting and pertinent to our subject to see how far it is possible to recognise and arrange in an orderly system to facilitate study, the various complex areas which make up the physical setting in which human activity takes place. It is even more important from the standpoint of the cultural landscape to see how far it is possible to classify geographical areas from the cultural viewpoint. Many writers have in the past divided the world into major natural regions. Of these Herbertson [4] was one of the first. His natural regions were based in the main on climate and vegetation. He was followed by Unstead and Taylor [5], and later by Unstead alone in an article in the *Geographical Journal* in 1916. The latter further suggested that we should not confine ourselves to major regions, but should begin with small units and work up [6]. He followed his original article with one in the *Scottish Geographical Magazine* in 1926, in which he applied his ideas to the Iberian Peninsula [9]. Many writers, including Mackinder, Fleure, Roxby, Fawcett [7, 8, 12], and others in England ; Passarge and others in Germany [10, 11]; and Jones and Whittlesey, and Fenneman in the United States, have developed the subject along specific lines. Most of these writers have used definite criteria for their divisions, such as climate, economic products, administrative subdivisions, population, etc., and, with the exceptions of Passarge and Unstead, have confined themselves mostly to large natural regions. The present writer has been working at a system of classification for both the natural and cultural subdivisions of the East Midlands with Leicester as its chief focus, for the past ten years, in connection with courses on the physical and human geography of the region. Although in some ways his system with reference to the natural units is like that of Passarge, his attention was not called to the writings of Passarge until the system as outlined below had been worked out in its main essentials. Although the cultural subdivisions are based chiefly on conditions in the East Midlands, the writer believes that with certain modifications they are applicable to the world as a whole.

The system in essence consists of a series of divisions or groups built up from the natural and cultural elements, each higher group representing a combination of the parts of the preceding group. There are some five of these groups, the last one being the cultural and natural region of the East Midlands with Leicester as its focus. The system has not in the same form been carried above this point, but a modification of the major natural regions of Herbertson has then been followed for teaching purposes. Beginning with Cultural and Natural Elements, they are combined to form Cultural and Natural Units. From them are formed Cultural and Natural Features which are further grouped into Cultural and Natural Districts. A combination of Cultural and Natural Districts gives us the Cultural and Natural Regions. On the side of the physical setting the chief criteria adopted are the grouping and repetition of phenomena; while on the cultural side the main criterion is the organisation which has developed through man's efforts to adapt nature to his needs. These criteria are supplemented and modified by others where such modification seems desirable in relation to the object in view. This arrangement enables one to overcome to some extent the difficulty, evident in most systems of classification, of reconciling a division based on the physical setting with one based on the human activity. The test in each subdivision is a change in the characteristic grouping or arrangement of the major phenomena or forms which make up the physical and cultural settings.

Cultural and Natural Elements

Beginning with the elements, we can usefully classify them both on the cultural and physical sides as 'fixed' and 'movable,' remembering that the terms are relative, and correspond roughly to the structural and physiological functions which they serve. The terms are discussed in Chapter 2. The chief 'fixed' cultural elements are buildings, fields, fences, hedges, paths, roads, railway tracks and related gear, bridges, canals, locks, pithead gear, spoil heaps, and similar items. The

'movable' ones are crops and livestock, minerals and rock won from the crust, wagons and vehicles of other sorts, machines, implements of husbandry, and man. On the side of the physical setting the chief 'fixed' elements are structure, slope, and soils, and the chief 'movable' ones are climate, including

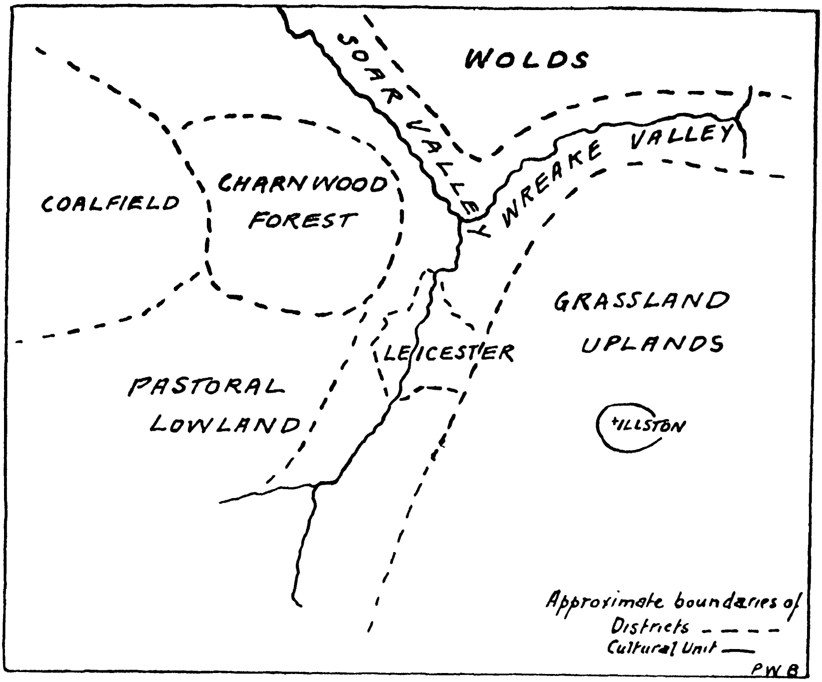

FIG. 6.—DIAGRAM, LEICESTER REGION.

temperature, air movement, rainfall and humidity, drainage, and vegetable and animal life.

CULTURAL AND NATURAL UNITS (Fig. 6)

On the cultural side a simple combination of such elements as fields, buildings, fences, paths, crops, animals, and men produces the individual agricultural organisation unit—the farm. Or a collection of buildings forms the village, an organisation unit of a different character. The buildings, pithead gear, and spoil heaps, with related roads and railway track, wagons, and workers give us the individual mine, or

with a slightly different grouping and arrangement, the quarry. These form the main cultural units of the countryside. In a city the grouping of buildings or the utilisation of a section of a building for a particular activity, together with the men who are carrying on the work, gives us the individual organisation unit of a factory, a wholesale establishment, a firm of accountants, a municipal activity, and so on for the many activities which form part of a city's development. The cultural units are thus small organisation units and fall under four main heads: those which are related to the indirect production of materials from the crust, like farms, those related to direct production as mines or quarries, those which form small community centres in rural areas, and those which are connected with urban activities in towns and cities. They are typified by the individual farms, mines, quarries, villages, manufacturing, municipal, social, and transport units which go to make up the human activity side of the Leicester Region. They form a series of cultural 'topographical' units comparable to some extent to the physical units in which they are found.

A simple combination or grouping of one or more of the natural elements makes up a wooded or grass-covered hillside, a river bottomland, a bare rock outcrop, a marshy flat, a patch of forest, a fertile piece of cultivable land, or simply a piece of flat ground with suitable foundation on which to erect a building. These and others like them form the natural units on which the different cultural units have developed or have been prevented from developing as the case may be. Surface characteristics are the main criteria. A farm may be related to one or more of these simple units, a quarry to a piece of bare outcrop in an otherwise fertile area, and a village to a suitable site in relation to drainage and slope.

Cultural and Natural Features

The cultural feature is a group of related cultural units. The main criterion here in place of the individual organisation unit is a community centre with its surrounding activities.

The village of Houghton on the Hill with the grass farms it serves in East Leicestershire, that of Billesdon in the same district with its farms, that of Croft with related quarry activities and some farms in the southern part of the county, that of Helidon in Northamptonshire with both grass and arable farms and mining activities, that of Ellistown with its neighbouring coal mines on the Leicestershire coalfield, are all examples. While a city such as Leicester is a community centre, on grounds of size among others, it is not directly comparable to, and cannot be classed as a cultural feature, but the various areas and groupings within the city can be so regarded. The grouping of separate organisation units or firms to form manufacturing, retail, wholesale, residential, or professional areas may be useful regarded as on a par with the village community and its related activities, and may be thus thought of as cultural features which go to make up the city. We are beginning to get that blending, that wholeness, that unity which is of the essence of geographical study and outlook.

The wooded and grassy slopes, bare outcrops, small upland flats, river flats, patches of woodland, marsh, and stream which form the natural units combine to make the natural features of hill and valley, escarpment, and plateau. Two or more slopes make a hill, two or more slopes and a stream in a different arrangement make a river valley, slight slopes of small extent make a piece of undulating country. In such fashion the natural units combine to make the natural features in relation to which, or a small group of which, we tend to find the features of the cultural landscape. Thus Helidon is related to a small group of such features, Houghton on the Hill to a series of slopes, Croft to a small hill with surrounding flats, Ellistown to a series of small flats, a nodal point, and part of the underlying coal seam, one of the manufacturing areas of Leicester, to the river valley, and the chief residential area to a small plateau. The natural features like the cultural features may possess variety within the feature. These may be variations in slope or soil characteristics, aspect or drainage, or even climate in a minor way.

Cultural and Natural Districts

The cultural districts are formed by grouping of the cultural features. A group of villages and related farms and a small mining centre, as at Tilton—all on the grassland uplands to east of Leicester; a group of villages and farms with some quarrying centres and a small market town like Hinckley in the pastoral lowland to south-west of Leicester; a collection of mining centres with a local market and organisation community centre such as Coalville form the Leicestershire coalfield district; a group of villages and farms and quarries in the Charnwood Forest district to north-west of the city; the grouping of the various areas to form the city of Leicester itself: all of these are typical examples of the cultural district (Fig. 6). The criteria used in determining a cultural district are a combination of a series of more or less related features which tend to repeat themselves throughout the district, with or without a community centre relating to the whole; or a major community centre itself with its related parts as illustrated by the city of Leicester with its manufacturing, wholesale, retail, professional, municipal, and other areas combining to form the whole. The boundaries of such a district are not always clearly defined, but the heart of the district is, and the boundaries can often be drawn where the characteristic grouping changes, as in the clearly demarcated line between the upland grasslands east of Leicester and the highly tilled country beyond Uppingham (see Chapter 10).

The first criterion used above—a combination of a series of more or less related features which tend to repeat themselves throughout the district—is applicable to the natural districts. Their boundaries come where the characteristic grouping of natural features changes. As a secondary criterion we have surface characteristics in relation to human use. The grouping of wooded hills, bare, rocky peaks, and cultivable valley floors to form the Charnwood Forest district; the combination of small clay-covered plateaux, slight hills, and deeply incised river valleys to make the upland grasslands, the underlying

coal seams and even topography of the Leicestershire coalfield, and the undulating slopes of the low-lying pastoral country to the south-west, are all excellent examples of natural districts whose boundaries more or less coincide with those of the cultural districts.

Cultural and Natural Regions

Eight clearly marked cultural and natural districts unite to form the Leicester Region. They are the Charnwood Forest, the pastoral and quarrying country to south of the forest, the Leicestershire coalfield to west, the wold country to north, the upland grasslands with a little iron mining to east, the Wreake and Soar valleys in the centre, and lastly Leicester itself, the key to the whole region. The test of a region would appear to be the relationship of the districts to a major focal point within the region, or the complex combination of many diverse but related areas or activities without a definite focal point. The Leicester Region is a good example of the first. With certain minor exceptions as to parts of districts, the whole of the areas linked to form the Leicester Region look to Leicester as the centre of their commercial, industrial, social in the wide sense of the word, and intellectual life. It forms thus a regional capital or focus, the influence of which has been accentuated by the modern developments of means of transportation. Though we have said little above in our discussion of the various groups about transport, it is clear that from the organisation standpoint, transport in its many forms plays an essential part in each combination. The working of the farm or mine or manufacturing unit, the linking of the villages to the farms, the unity of the coalfield and of the city are intimately related to transport. To the regional centre in relation to its region, systems of transport are the great arteries comparable to those of the human body. To the market-place, the fairs, the shopping centres, the professional areas, the centres of administration, and the social, recreational, and intellectual activities of the city, the country and urban folk come in by road and rail,

car, bus, train, and on foot. The unity of the natural as well as the cultural districts depends on this linking from our standpoint of man's use of the region.

Of the second variety of cultural region the Corn Belt may be taken as a type. Here there is a complex combination of diverse but related activities, possessing many cultural features in common, yet showing diversity in its zones or districts, based on variety in use. We have not space here to analyse its groups in detail, but we may refer to its cultural units or farms related to flats or slight slopes, its features or group of farms and small town or village related to natural features, and its districts or grouping of towns and farms in relation to a dominance of corn for grain, corn for hog feeding, or corn for beef production, as the dominant activities, with small market and administrative centres related to the group as at Bloomington. The whole combines to form the cultural region of the Corn Belt, possessing a marked similarity of many cultural forms based on the chief modes of utilising the land. Approximate zones or boundaries can be drawn where the major utilisation of the land changes to wheat in the north-west, wheat in the south, ranching in the west, and mixed farming and industry in the east. The boundaries thus approximately coincide with zones where changes occur in the environmental setting. These are chiefly climatic to north-west and west, changes in soil characteristics to south, and in soil characteristics and structure to east.

Although difficulties exist in drawing boundaries, and a certain amount of overlapping occurs, these difficulties are at a minimum in areas where there is a strongly marked regional centre. The emphasis is then laid on the organisation originating in man's effort to satisfy his needs by adapting nature. Man's will or initiative becomes the dominating factor. The boundaries become of less importance and the heart or core of the organism is of maximum moment. On this basis, that is, the basis of man's initiative, we can readily distinguish areas like Java, which under Dutch stimulus has highly developed, from other areas, as in the East Indian islands, with

somewhat similar natural settings, but which, lacking that stimulus, have failed to develop. We can further consider the possibilities of development in areas at present largely negative from the human standpoint which may with the growth of human knowledge and initiative play their parts as human habitats.

The terminology given above was only adopted after careful consideration. It presents the difficulty that in common usage the terms are employed in many different senses, but failing common agreement as to usage of terms, it seemed desirable to adopt terms which on the whole suggest the connotations here applied to them, rather than invent new ones.

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Chapter 7

THE CULTURAL LANDSCAPE OF SHELTER

The cultural landscape considered as an expression of man's adaptation of nature in the effort to satisfy the desire for shelter. The distribution of houses and other buildings, chiefly in England and Wales, considered as an example. The chief element of the cultural landscape is the building. It is a universal element found in connection with every form of man's activity. A classification of man's activity and settlements based on the distribution of buildings.

THE features of the cultural landscape vary in size, shape, distribution, and character with the activities of the community, the nature of the environment, and the time-period factor. Hence, as we have seen, the cultural landscape is the objective expression of the relationship between human activity and the environmental setting. In this chapter we endeavour to see how far the distribution of houses and buildings, chiefly in England and Wales, forms a satisfactory index of the human activities of the different regions and of the distribution of population, particularly in small areas.

The house or building may be regarded as the most universal element of the cultural landscape. Man makes houses and erects buildings to live in, work in, and store things in. Buildings therefore form an index of the distribution of man. The natural environment plus the time-period factor may influence the kind of house, the material of which it is composed, its shape, and the distribution of buildings on the face of the countryside. The distinguished French geographer, M. Brunhes, in his *Géographie Humaine*, has done much to indicate the effect of environment on the individual house, its shape, and the materials of which it is composed. Mr. Batsford has written on the subject with reference to England [1]. Demangeon and La Blache [2], among others, have dealt to some extent with the relationship between the

distribution of houses and the natural environment, the latter pointing out the striking line of villages found in the deeply cut valleys of Champagne. Mr. Platt discusses the distribution of *estancias* in the Argentine Pampa [3]. Mademoiselle Lefevre constructed a house density map for Belgium in 1923, and Dr. Leyden has published a *wohndichte* map, one showing the density per house. Both of these latter maps are based on the statistical material for the smallest administrative unit in Belgium, the commune, and represent the density idea applied to houses instead of people.

Following out a suggestion first put forward by Dr. Mill for the ½-in. map, the writer for the past twenty years has prepared maps from the 1-in. O.S. maps and from the Canadian and American maps and certain French and Swiss maps which showed, by tracing off the houses and buildings, their actual distribution free from the many other sets of facts given on such maps. Unless this is done in the first instance the mass of other detail tends to obscure the pattern produced by the distribution of buildings. In all, nearly two hundred of these tracings have been prepared, and many of them have been reduced to the ¼-in. scale by photography.

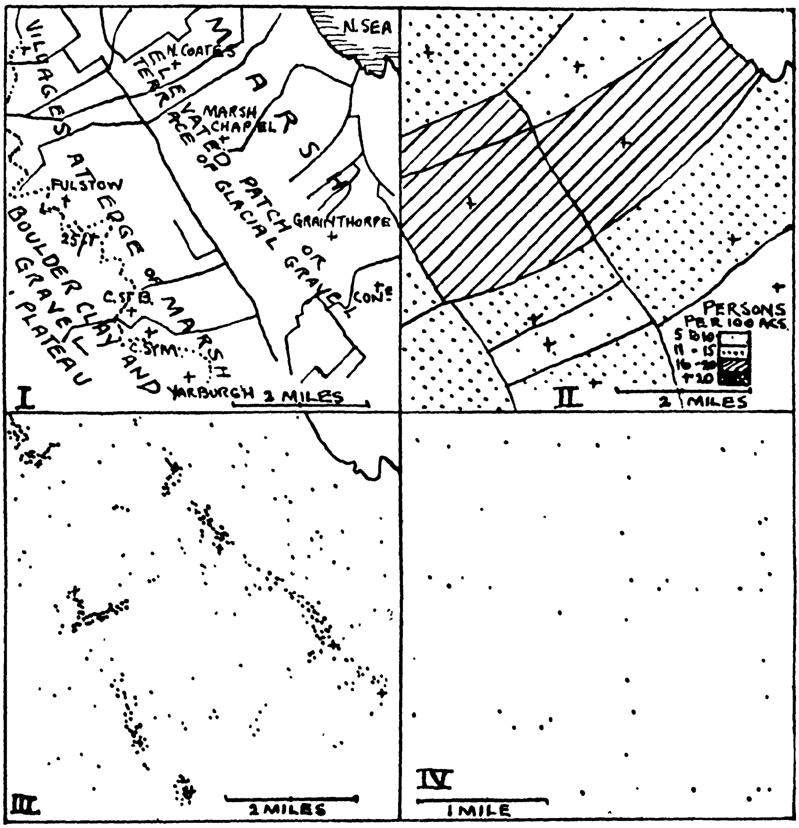
A study of these maps led to some realisation of the importance of the building as an element in the cultural landscape and as an index of population. It suggested the desirability of making a fuller study of them to see in the first place how far the pattern assumed by this distribution, or the house-pattern map, as it may perhaps be called for convenience, forms an adequate expression of the distribution of population, that is, how far the pattern varies with the type of activity, the character of the settlement, and the natural setting; secondly, how far it is possible to classify the patterns; and thirdly, how far it is possible to produce a better, in the sense of being a more expressive, type of population map, especially with reference to the detail of districts, than has hitherto been produced for the country as a whole. What follows falls broadly under these three heads, but is chiefly concerned with the first two, for though much work has been done towards

the production of a map for the whole of England and Wales on the ¼-in. scale, it is not possible in a book of this nature to reproduce many of the maps.

Before we examine the extent to which the house pattern varies, it may be helpful to glance at the material available for the study of population distribution, the extent to which it is used, and something of the defects of methods based on the statistical material available. The chief body of material consists of the statistics to be had for the various administrative subdivisions on which the census is based, together with the maps of such subdivisions. The census records the number of people in each parish. From the parish statistics of population and area, the parishes can be arranged in order of density, a system of grouping can be adopted, and the areas of the parishes on the map shaded or coloured to bring out the density. A map so constructed for a small area bears little satisfactory relationship to the units of the natural environment. The reason is clear. The parish as we have it to-day evolved from a system of land tenure designed to include in each administrative unit a series of samples of different kinds of country. Hence the parish or statistical unit may coincide not with one geographical unit, but with parts of several. Thus a Sussex parish may have a strip of wet clay suitable mostly for grazing, a strip of fertile chalk marl highly tilled, a strip of steep escarpment chalk useless except for lime burning, a strip of open downland suitable for sheep, and a strip of wooded country from which firewood can be obtained. Obviously the density of settlement in each strip is very different, hence a population map showing a uniform density throughout the parish, though statistically accurate, is an inadequate expression of the varying human activities within the area.

Various modifications of this method have developed from time to time. They mostly involve a combination of the parish statistics and the distribution of the houses. A dotting system has been employed, so that in the parishes instead of the density being represented by shades of colour it is shown by dots, one for five or more people, and the dots can be grouped

in relation to the distribution of houses. The writer has found in practice that the actual distribution of the houses themselves is more suggestive, in spite of defects discussed later, than any system of dotting in combination with the houses.



I SKETCH MAP of PART of LINCOLNSHIRE MARSH ······ 25 ft Contour line
II PARISH POPULATION MAP of SAME AREA
III BUILDINGS MAP
IV FARMS IN CORN BELT NEAR MACOMB, ILLINOIS

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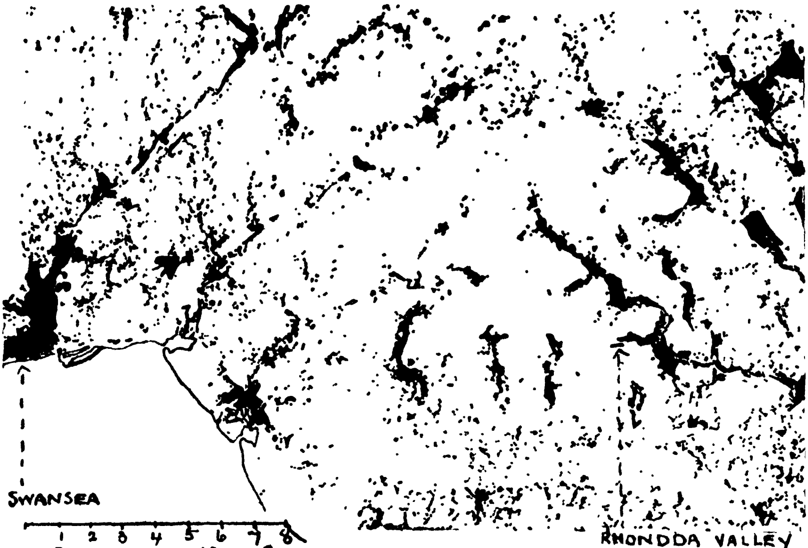
FIG. 7.—DIAGRAMS OF LINCOLNSHIRE MARSH AREA.

We may usefully take an example here to illustrate the advantages of the house method over the parish method of shading, which in most maps is the commonest method employed. If we examine the Lincolnshire marshland (Fig. 7),

we see a double line of villages separated by drained marsh, with marsh between the last line of villages and the coast. The first of these lines is along the edge of the marsh; the second is on a low patch of glacial gravels parallel to the coast but about two miles inland. The parish map hides rather than reveals the relationship of the population distribution to the environment. The house-pattern map shows clearly the double-village line with the relative sizes of the villages and the scattered settlements on the marshlands. Beyond to south-west there is a similar population line at the foot of the Wolds. It is likewise hidden on the parish map but stands out clearly on the house-pattern map. Other examples could be taken in many areas.

If we turn to South Wales (Fig. 8) the house-pattern map expresses well the type of settlement in relation to the natural environment. Here there are some three chief patterns. To south, in the agricultural area, there is a fairly even distribution of houses. To south-west, on the coast, there are a number of large centres. Most of the region is occupied by a pattern consisting of a definite arrangement of lines running north-west south-east, north-south, and north-east south-west. This is a region of moorland pierced by deeply cut valleys in which the chief activity is coal-mining. The concentration of the mining population in the bottoms and sides of these trenched and steep-sided valleys, in what is practically a series of continuous large villages, produces some of the main sociological problems of South Wales, such as overcrowding. A parish population map of this area would merely show the population evenly spread over valley and moorland, and would therefore give no impression of the true distribution, or of the character of the environment. While all these facts are evident from a careful examination of the 1-in. O.S. map of the district, the facts are not so strikingly brought out, or the nature of the pattern made clear, until the buildings are seen separately. On this point it can hardly be emphasised too fully that it is the actual pattern assumed by the distribution of the buildings rather than the exact density of the population, that is of



DISTRIBUTION OF BUILDINGS — SOUTH WALES

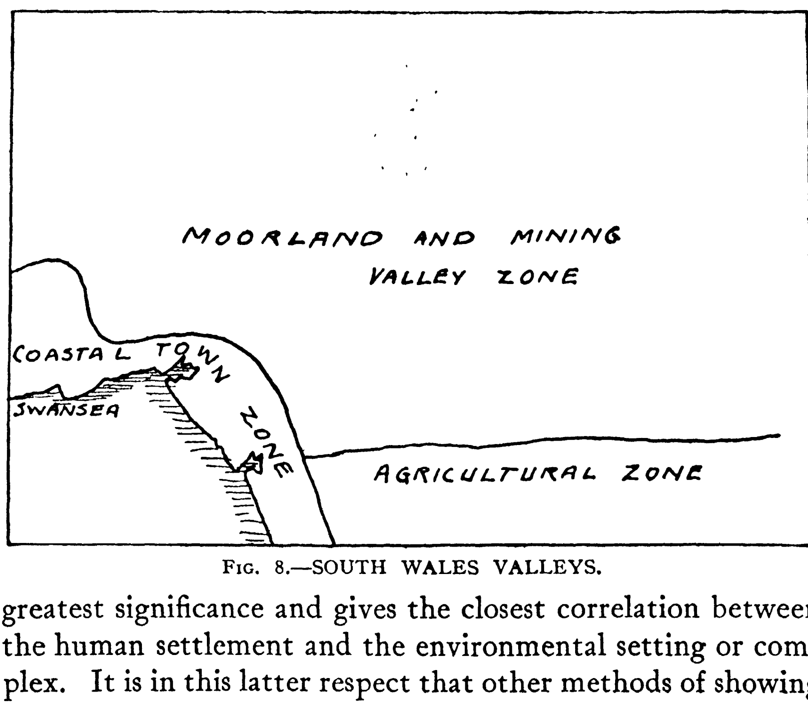


FIG. 8.—SOUTH WALES VALLEYS.

greatest significance and gives the closest correlation between the human settlement and the environmental setting or complex. It is in this latter respect that other methods of showing population density tend to fall short.

One of the best ways of seeing the utility of the house-pattern maps is to examine a series of strips across country at right angles to the zones of major activity. Space does not permit us to examine such strips here in detail, but we may outline two such strips. From Liverpool to Grimsby we have a succession of such zones. The concentration at the mouth of the Mersey at the port, the thinning out beyond until the Manchester region is reached due to the Chat Moss, the great concentration around Manchester with its radiating arms linking it to adjacent centres, the valley population extending up into the flanks of the Pennines, the thinning out on the great moorland with its scattered road population, the renewed concentration on the coalfield round Sheffield and Barnsley, the scattered agricultural population of the vale of York, the north/south orientation of village groupings in Lincolnshire—these, and the details connected with them, stand out clearly on the house-pattern maps, which thus show the changing activities and natural environmental settings of the various strips of country passed over. Similarly in an examination of a strip from Leicester to the coast of Norfolk, we see a series of zones of which the chief are the city itself with its radiating arms spreading out into the countryside along the main roads, the double village lines on each side of the Soar and Wreake flood plains, the clay-covered Leicestershire grassland with its even spread of houses and its small villages extending to Uppingham, the large villages with few intervening houses in the rich tilled country of Rutland, the line of villages along the edge of the fen, the regular linear layout of the houses along the straight roads of the fen focusing on old islands such as Wisbech and Spalding, the sparsely settled heathlands of Norfolk by Swaffham and Thetford, the large agricultural villages and few houses apart from them of high Norfolk, the thinly peopled Broads, and the coastal settlements like Yarmouth (Fig. 46). All these changes in activity and environment are reflected in the varying house patterns, which thus bring out instead of obscuring the relation between man and his environment.

The house patterns clearly do vary in response to certain factors. Is it possible to classify these patterns? At first sight it might appear that because of the very flexibility and responsiveness of the pattern satisfactory classification is difficult, but though difficult, and necessarily tentative in character, it may be useful to attempt such classification.

Classification can usefully proceed along two main lines according to whether the emphasis is laid on striking forms of the natural environment or on the specific human activities. In every case both are involved, the difference being merely a matter of emphasis. On the whole, patterns appear to be best based on human activity with striking forms of the natural environment producing specialised variations.

Little progress was made in classification until a unit of area was adopted, since within the area of any 1-in. map there may be several different patterns. As a unit, after many careful tests a square of 3-in. sides, that is, 9 square miles of country, was adopted. This unit was first hit upon as a result of the writer's habit of drawing sketch-maps for lantern projection on a lantern slide cover glass. It was applied to many different parts of the country and was found to give, on the whole, a suitable unit within which a more or less single pattern stood out. It also had the advantage that if one excludes the main mountain areas, the Cheviot, the mountains of the Lake District, the Pennines, and the Welsh Mountains, there are only three spots in England and Wales where one can find 3 miles by 3 miles of country free from a building; one of those is on Exmoor and two are on Dartmoor. Even in the mountain areas one has to hunt for such spots. They are mostly found on grouse moors.

Using the above unit we can clearly distinguish the following patterns[1] which are repeated in many parts of the country.

1. *Almost Uninhabited or Very Thinly Peopled Areas* (Fig. 9). —Under this head fall the smaller areas of moorland, such

[1] It is only possible in a book of this nature to discuss the patterns in outline. It is obviously desirable that they should be worked out in much greater detail in a series of comparative studies.

as the gritstone moors east of the Derwent valley, the coastal strips of Devon between Ilfracombe and Lynton or Porlock to Minehead, the south-west Pembroke coast between Linney Head and the Wash, the coast of Gower, the heathland west

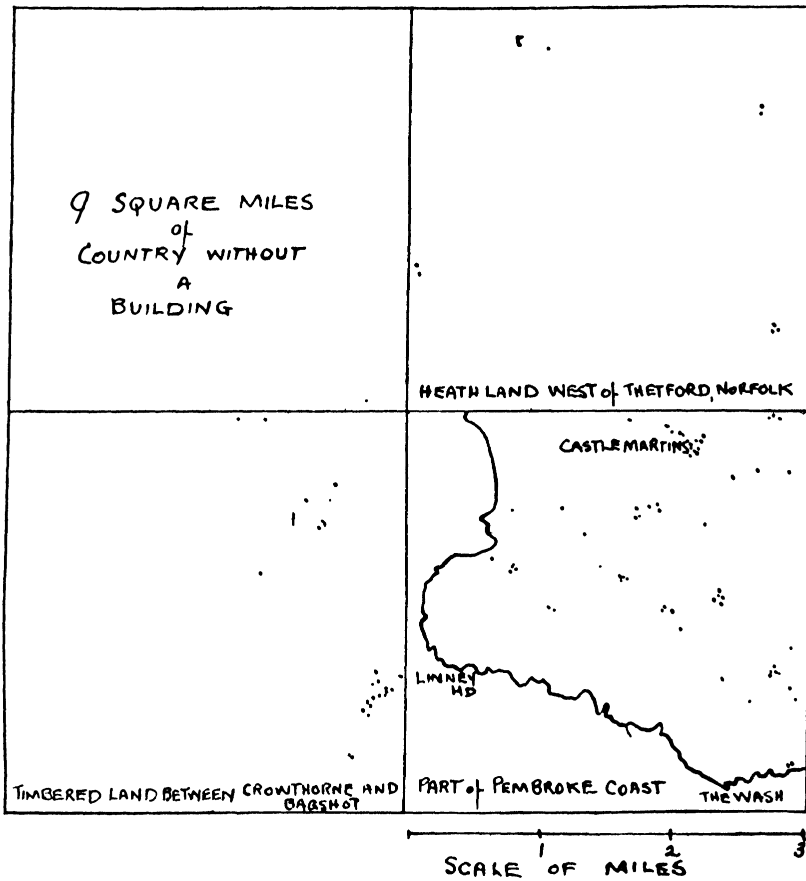


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FIG. 9.—HOUSE PATTERNS, THINLY PEOPLED AREAS.

of Thetford in Norfolk, the Bagshot area near London, the sand-dune areas and marshes of Norfolk, and the wooded areas of Sherwood and the New Forest. A few scattered dwellings, gamekeepers' houses or woodcutters' huts, are the chief shelter elements found in them. Similar areas are found in many other parts of the world, as in the drier ranching areas of

New Mexico. In the British Isles many of these areas would form admirable national parks and national preserves, and some are now in process of being used for recreational purposes.

2. *Pasture or Grassland Areas* (Fig. 10).—The grassland pattern is characterised by a relatively even distribution of houses or farms with their associated buildings forming a dispersed or scattered type of settlement. They appear to be mostly associated with stock farming rather than arable, with the reclamation of forest land and heathland, and with the conversion of the poorer kinds of arable to grassland. The village as in Anglesea is usually very small and insignificant (Plate 10). In north and east Wales villages appear to be definitely based on a pastoral utilisation of the land and the reclamation of waste land [6]. In the Douglas valley in Lancashire, the dispersed type now found in connection with agriculture appears to have followed the reclamation of the forest land which probably once covered the gentle slopes leading to the meadow by the river [7]. In Northamptonshire and parts of Leicestershire the dispersal seems to have been in part due to forest clearing, the extension of pasture farming, the taking in of waste land, and minor variations in topographical features. In the upper Derwent valley in Yorkshire, the isolated farms are in a region of moorland dales where stock raising is the chief activity [8]. In the old forest lands of Shropshire, those of Wyre and Brewood, the scattered dwellings represent later enclosures of land mostly devoted to grazing [9]. Other typical grassland patterns in England and Wales are found in the Lampeter district, in the Dee valley, in Lancashire north of Preston, on the lower lias clays of Warwickshire, on the grassland north of Newcastle, and on the grassland of Leicestershire. In parts of the Midlands, as in east Leicestershire, we have a region which was once poor arable land and has now gone over wholly to grass. Here the villages are more marked than in the western grasslands, and the subsequent dispersion of houses in the grasslands took place at a later date than the arable developments. We find a region which

partakes in part of the tillage type, but one in which there are far more intervening houses and much smaller villages. This is typical of districts where a change-over from tillage to grass has taken place (Fig. 10).

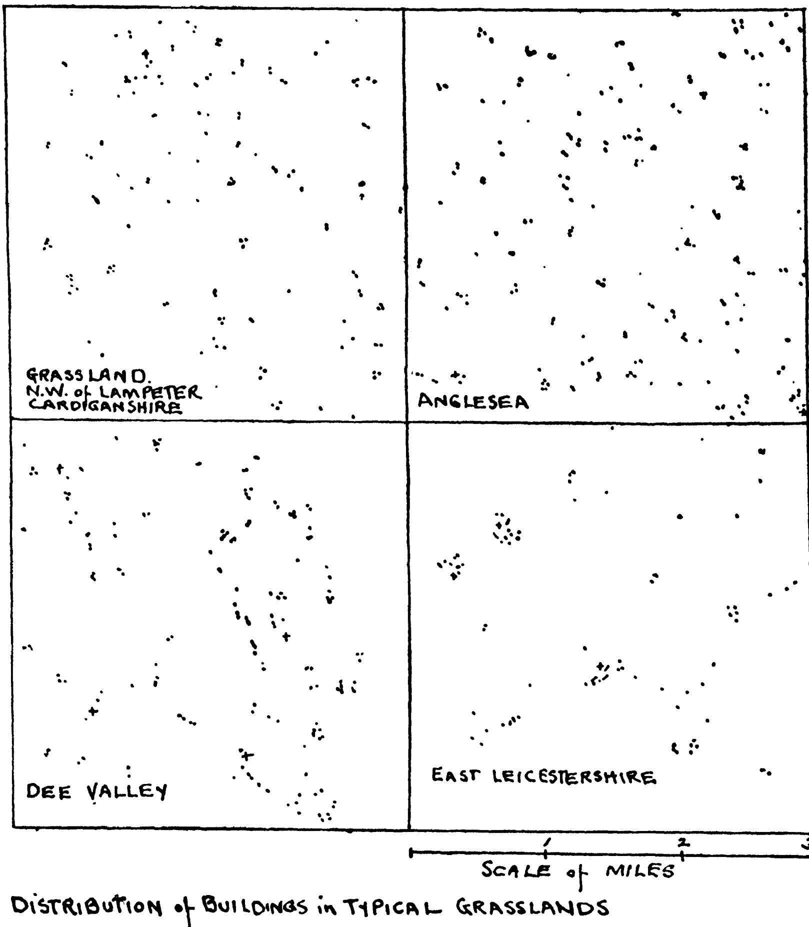

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FIG. 10.—GRASSLAND PATTERNS.

In other parts of the world dispersed habitations are not necessarily so closely connected with grassland areas. In western U.S.A. it is typical of the ranching country (Fig. 19), but in regions of extensive farming such as are found in the Middle West and in the Canadian prairies, the dispersed type

is the rule. In such regions the pattern, owing to the rectangular layout of the land holdings on the vast level plains, becomes very characteristic and distinctive (Fig. 20). In Egypt also, once security was established and the need for concentration into villages above flood-level to some extent obviated by modern developments and flood control, there has been a tendency to dispersal of habitations on the newer lands [10]. A similar type of dispersal is seen in the Tokachi district in Hokkaido, Japan, where climatic and soil conditions favour a system of extensive and dry agriculture. The regular pattern of house distribution in this area reflects the influence of the American experts who assisted the Japanese in developing and settling this region [11]. Although in England and Wales the scattered type of house pattern, with certain exceptions, does seem to reflect pastoral activities, care is needed not to assume that that is true necessarily of areas elsewhere. While definitely influenced by the physical setting, the scattered type of pattern owes much to social, economic, and political influences, of which relative security, the absence of communal organisation, the enclosures of waste land, and the change from arable to pastoral farming, are probably the chief. On the environmental side, climatic and soil conditions producing grassland, flat topography in the absence of communal organisation or defensive needs, rough topography, reclaimed forest or heathland, among other factors, tend to produce the dispersed pattern.

3. *Arable or Tillage Pattern* (Fig. 11).—The typical tillage pattern consists of a series of large villages of the nucleated type, of which there may be many varieties, more or less evenly spaced throughout an area, with modifications in the degree of regularity which depend largely on the effect of soil and relief factors on types of agricultural activity and siting, the type being further conditioned by the physical setting modified by proximity to markets. Within the nine-square-mile unit we find in Cambridgeshire, Rutland, High Norfolk, and Hertfordshire, among others, some four or five large villages. In the good loam district of Norfolk there are rather more.

In the highly cultivated good sands area of north Norfolk, where only large farms pay, the typical pattern consists of one big village or small town with large farms scattered widely apart. On the basis of the general pattern we can thus dis-

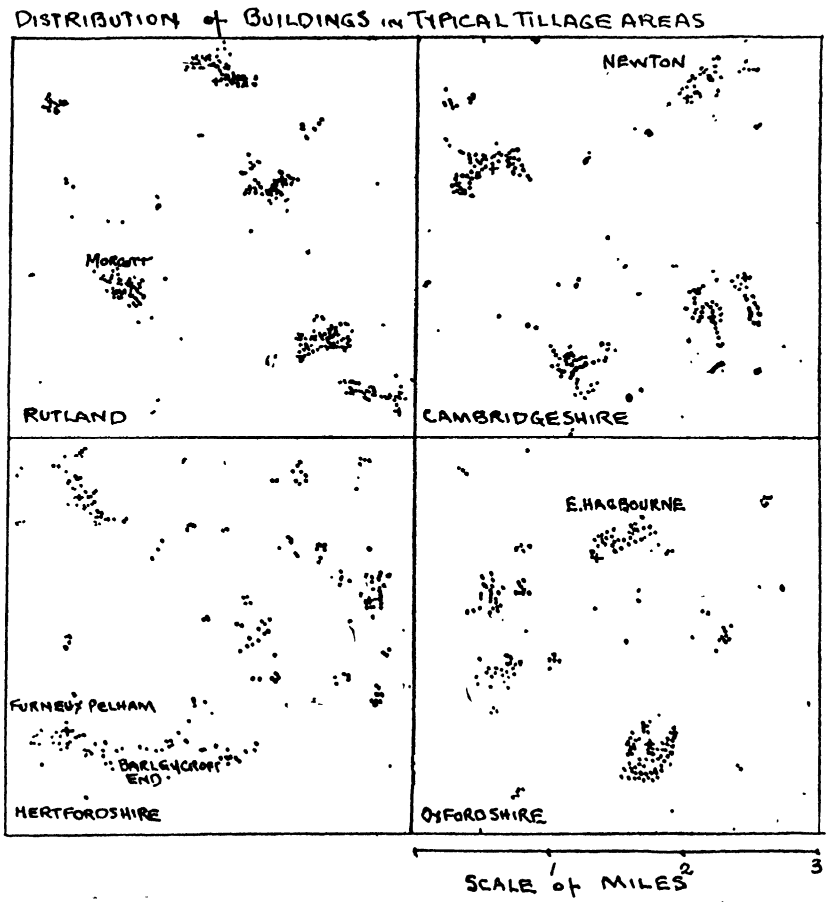

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FIG. 11.—TILLAGE PATTERNS.

tinguish two agricultural patterns, the one being that of the good sands area of Norfolk, the other that of the rich wheatlands of Oxfordshire.

An examination of village shapes enables us to make a series of subdivisions of the pattern, which, in part, depend on the physical setting, and in part on the time-period factor.

10

These are the compact type, the hamleted type, the ring-fence type, the splayed type, and the linear type. The most common are perhaps those of the compact type. They probably developed round a well or spring, or within an enclosure for defence. The Saxon and other invaders entering England moved up such rivers as the Trent, the Soar, the Welland, the Ouse, and the Nene. They commonly formed their settlements on patches of higher ground a little way back from the river on the lower slopes which led up to the forests on the water-partings [12] [13]. They built compactly partly for defence and partly on account of their communal organisation. Similar settlements were made on the spring lines at the foot of the North and South Downs, the Chilterns, and the Lincolnshire edge. The splayed type is found in districts like Hertfordshire, where the farms have been built close to the ends of the village and many of the names end with the word 'End.' The result is to give the villages a curious splayed appearance which is clearly recognisable on the house-pattern map. The ring-fence type developed in forest areas around clearings in the forest, and were probably originally used for cattle grazing and for homes for woodmen. To-day they are recognisable by the roughly circular or oval space round which the houses have been built. The hamleted type, which consists usually of two small villages or groups a little distance apart, seems to have arisen where for some purpose an extension of the original village was needed. It grew in many cases where the first village lay off the road and a second group developed to take advantage of the road traffic, as at North Mimms and South Mimms, or where the original village was at the foot of or on top of a slight escarpment and a second village grew at the foot, as in the case of Upper and Lower Catesby in Northamptonshire, or where the growth of the original village was limited by topographical features. The linear type is usually due to restrictions to development imposed by the physical setting, as in narrow valleys or along river embankments, or is a road development.

There are many varieties of these types which tend to

blend into each other, and those selected here are put forward because they are definitely recognisable on the house-pattern map. They mostly agree to-day in representing agricultural communities and therefore come under the head of the general agricultural pattern. The names given to the types are those which seem best to indicate the characteristics of each pattern.

Many examples of the tillage pattern are to be found in other parts of the world. The compact agricultural villages of Lorraine [14], or Egypt [10], the *gewanndorfer* of north Germany [15], the roughly rectangular village arrangement of the Yamato district by the shores of the inland sea of Japan based (Fig. 12) on intensive rice culture [11], all of these, though varying in population density, illustrate the typical tillage pattern, where through physical, social, historical, and economic circumstances this agglomeration pattern has developed.

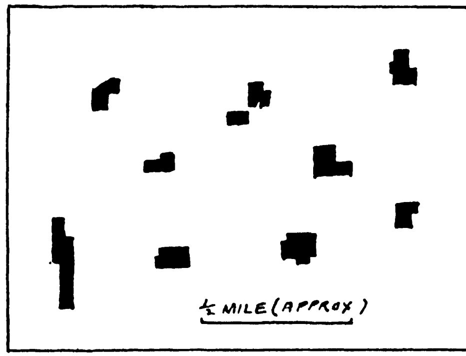

FIG. 12.—JAPANESE TILLAGE PATTERN.

We need to remember, however, that tillage conditions do not necessarily produce this pattern, though it is closely related to tillage conditions in England. The main factors other than physical which seem to have produced it are the communal system related to arable farming brought to Britain by the Saxons, the ethnic tradition of the settlers, as in the contrast between the Celtic tradition of the west and the Saxon of the east, the need for defence against both man and beast, as in the case of the wolves of early Britain and the tiger in India, and political restrictions, as in Britain in early times.

Natural environmental factors are closely linked to the above. Thus the siting of villages was much influenced by

local topography, as in the case of the Trent villages. This siting was partly for defensive reasons and partly for freedom from flood. The distribution of forest, marsh, swamp, and heathland limited the possible areas of settlement. Suitable soil conditions within the areas thus defined affected the development of the villages. The junction lines of geological outcrops in relation to the mixed soil characteristics produced at such points played their part in siting village lines. The water supply available from springs at such points in valley sides or along the foot of escarpments was probably an important factor in this siting, though Demangeon holds that this factor has been very much over-estimated, as far as producing a distinction between compact and dispersed settlements are concerned. He points out [2] that in the plains of Hungary where water is available at almost any point below the surface, the compact type of settlement is the rule, and that on the Caux region in France both types of settlement are found, the one to the east and the other to the west, on areas which from the standpoint of water supply are identical. While there may be some doubt as to the importance of this factor in the wetter parts of Europe, there is no doubt about its influence in the relatively dry region of the Mediterranean, and in semi-arid or arid districts as in India, where irrigation is practised.

In the foregoing account we have indicated two main tillage patterns with possible subdivisions. A third is found in regions where intensive cultivation either for fruit or market gardening is practised. In such areas the villages tend to be larger than in the normal agricultural pattern and the number of houses between the villages is much greater. The result is as if the tillage pattern and the dispersed type were combined and intensified. Of such regions the country round Evesham is a good example of the market-garden type of pattern and the area around Wisbech in the Fen is an excellent example of the fruit-growing pattern (Fig. 13). This latter pattern tends to be slightly specialised owing to the road pattern of the Fen to which it largely

conforms, but it none the less indicates the much greater density of pattern produced in a fruit-growing region. The importance of these lesser patterns could be overstressed, but they are as a rule recognisable. There is no doubt about the

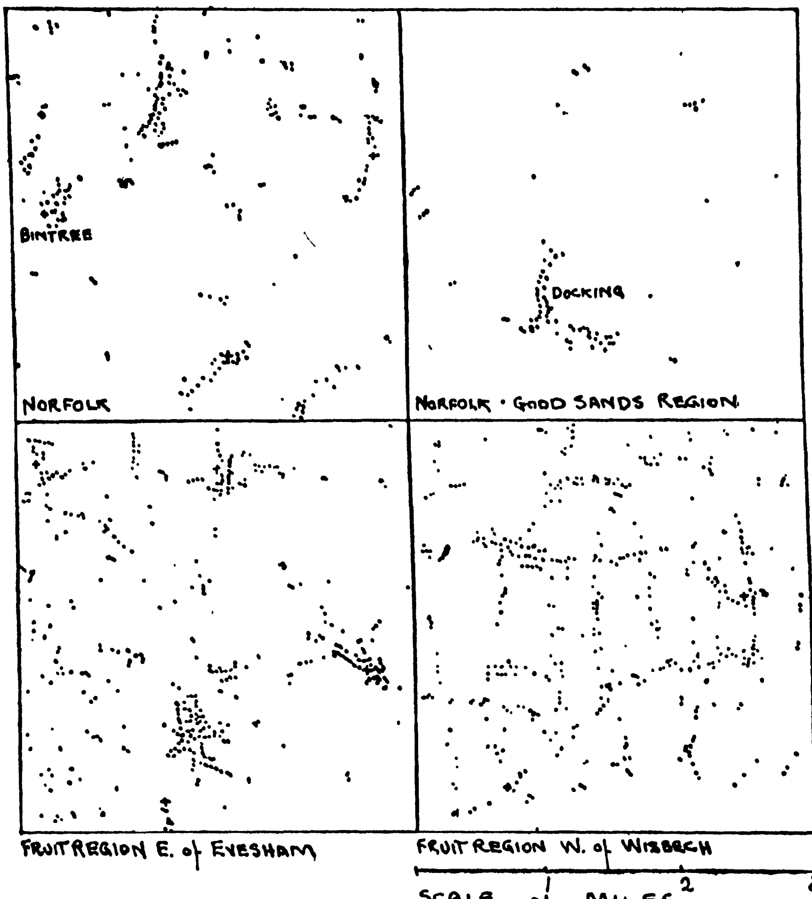

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FIG. 13.—SPECIALISED TILLAGE PATTERNS.

striking contrast between the tillage pattern as such and the grassland pattern. It is very clearly seen in the contrast between the scattered habitations and small villages lying east of Leicester and the large villages with few intervening houses in the region to east of a line drawn from Melton

to Uppingham, and extending thence to the Fen edge at Peterborough (Fig. 14). A number of other specialised tillage

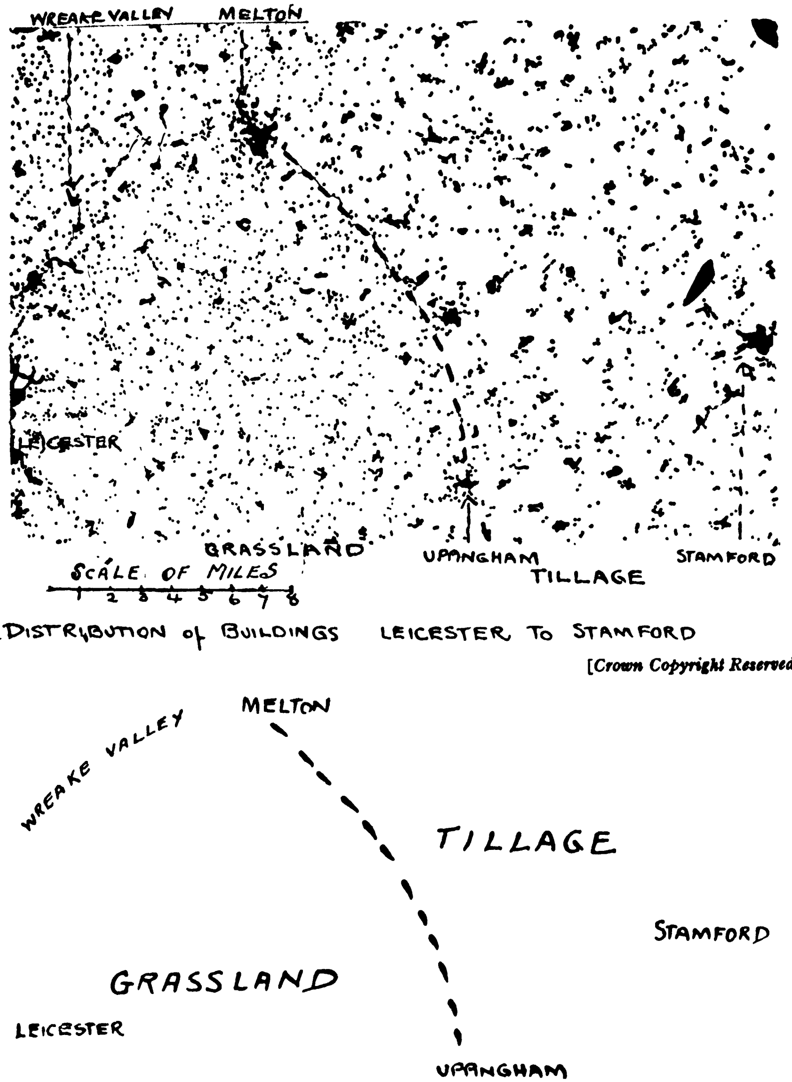

FIG. 14.—LEICESTER TO STAMFORD, GRASSLAND AND TILLAGE CONTRASTED.

patterns are considered under the head of linear patterns. As related to both pastoral and agricultural activities, we may next consider the mountain-valley pattern.

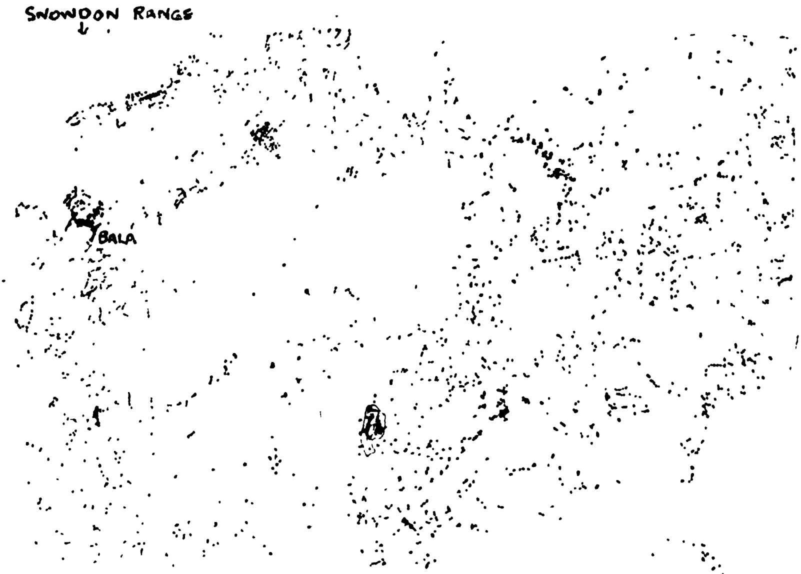

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FIG. 15.—MOUNTAIN-VALLEY PATTERN, NORTH WALES.

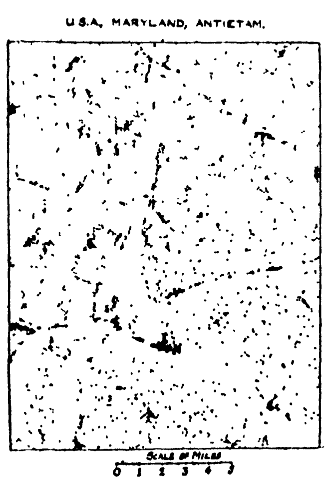
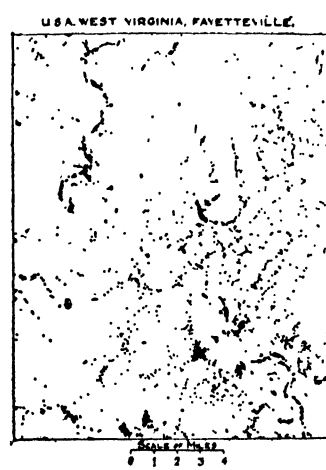


FIG. 16.—APPALACHIAN RIDGE AND VALLEY PATTERN.



[*Courtesy U.S. Geological Survey.*

FIG. 17.—WEST VIRGINIA RIVER VALLEYS.

4. *The Mountain-valley Pattern* (Fig. 15).—This pattern consists essentially of narrow zones of villages broad towards the lower part of the valley and narrowing towards the head.

Between the zones there are belts of mountain or moorland with few, if any, buildings. The zone shape is determined almost wholly by topographical features. The houses within

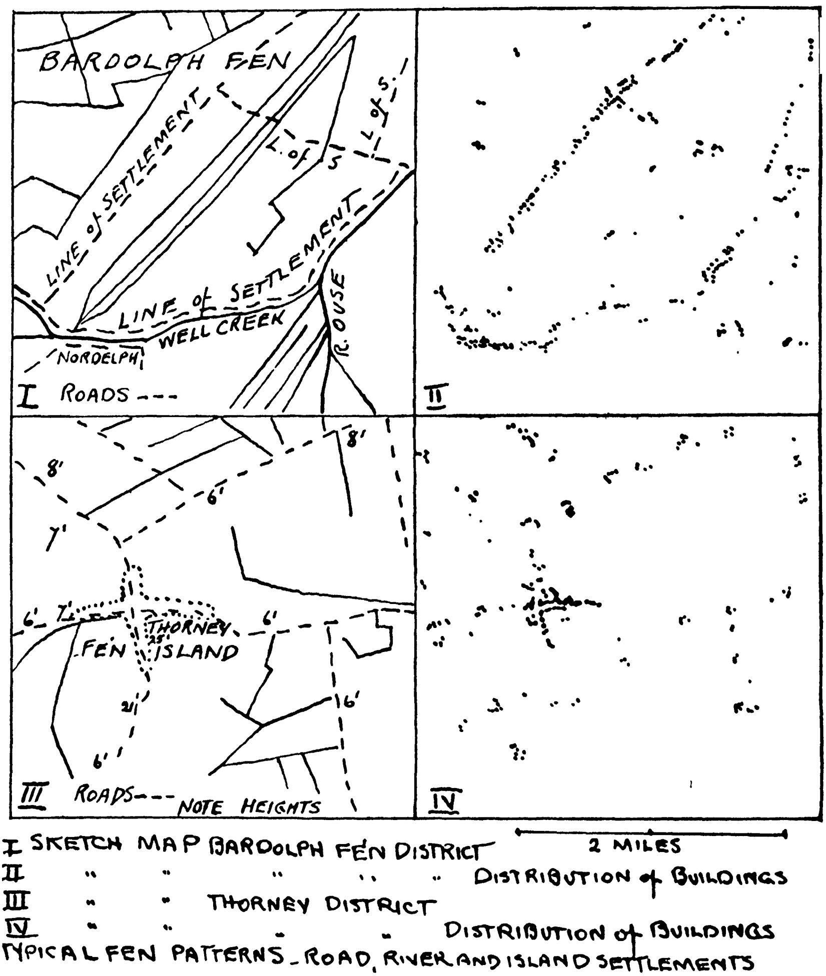


FIG. 18.—FENLAND PATTERNS. [*Crown Copyright Reserved.*

the zone may be either of the dispersed type or the tillage pattern. Such patterns are well seen in most mountain regions, as in the north Pennine country by Alston and Weardale, the Welsh mountains at Bala and Llandrindod Wells, and in the Appalachians. In this latter area, owing to the

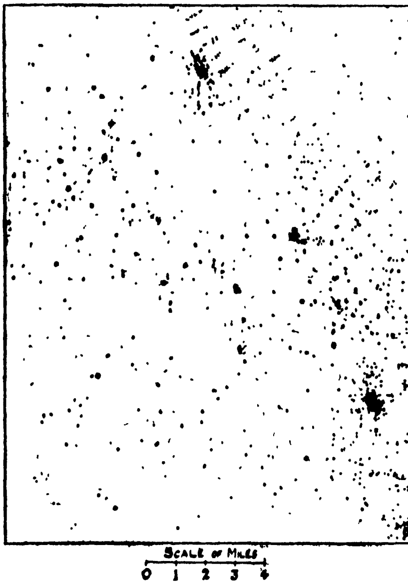
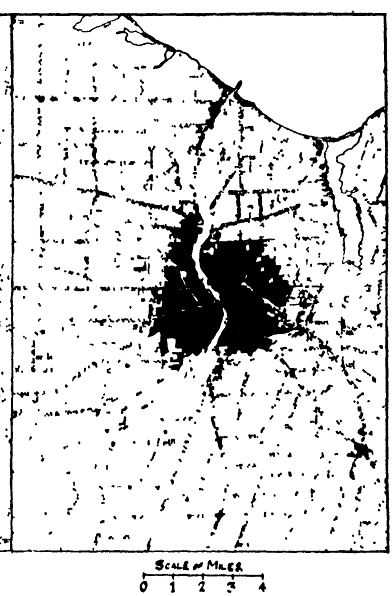


Fig. 19.—RANCHING AND IMMIGRATION PATTERN, CALIFORNIA.

Fig. 20.—CORN BELT PATTERN, MACOMB.

Fig. 21.—MISSISSIPPI LEVEES, SOUTH OF BATON ROUGE.



[*Courtesy U.S. Geological Survey.*

Fig. 22.—ROCHESTER, NEW YORK.

long, wide valleys, the characteristic narrowing towards the head is generally insignificant, but the south-west north-east mountain ridges stand out clearly as uninhabited areas (Fig. 16).

5. *Linear Patterns* (Fig. 18).—We now come to a series of highly specialised patterns, mostly of the tillage type, which appear to be conditioned mainly by such striking features of the natural environment as escarpments, deeply cut valleys, embanked streams, or roads. Usually such a pattern takes the form of a line, or series of lines, consisting of either separate houses or of villages with houses in between. The embanked road type is well seen at Bardolph Fen, where the houses are on both the transverse road across the fen and the embanked road alongside Well Creek and the Ouse. The river line of settlement can be seen along the embanked side of the River Parret in Somerset, and an even more striking example is that of the clearly marked lines of settlement on the Mississippi levees to north and south of Baton Rouge (Fig. 21). Similar lines of settlement are seen on the old levees of an abandoned meander on the Echigo plain in Niigata prefecture in western Japan [11]. Other examples of this type are the line of settlement in the moorland pass used by the Stainmore road, linking the head of the Eden valley with Scotch corner south of Darlington, the ridge road distribution in the State of New York near Rochester (U.S. 1-in. sheet) (Fig. 22), and the ribbon road development round such cities as London, Manchester, and Leicester.

Of the second linear type, where the line is made up of both villages and houses, and sometimes small towns, there are many examples. The valley lines of Salisbury Plain and the Cotswolds, the ridge roads of Somerset above marsh-level the line of villages along the foot of an escarpment such as the Mendips, or the north edge of Salisbury Plain, or the Lincolnshire limestone edge, the double line of villages along Trent and Soar and in the valleys of Champagne, the zone of villages along the north coast of Norfolk between the chalk and the marshes, the Chepstow-Blakeney zone on the

west side of the Severn estuary between the Severn flats and the woods to west, and the village zones of Lewis and western Scotland, all fall under this head.

6. *Mining and Quarrying Pattern* (Fig. 23).—There is a tendency in mining areas for the miners' houses to be arranged in long lines at the pithead or on adjacent roads or crossroads. This produces the characteristic miners' rows of the North, and a very characteristic house pattern. It is well seen in all coal-mining districts where there is little manufacturing. The presence of manufacturing produces a much greater density of population, which tends to obscure the pattern. The villages in a typical district are much larger than any of those which develop under agricultural conditions; their number and characteristic shape also help to distinguish the pattern from that of agricultural occupancy. In the district north of Durham, in that north of Newcastle, in the Leicestershire coalfield, and in South Wales, this pattern is very distinctive and unmistakable. Closely allied to it, only not usually quite so dense or extensive, is the pattern produced by the dwellings of the workers in iron mining, as in Cumberland, the tin mining of Redruth, and the china-clay working of St. Austell in the south-western peninsula. In West Virginia along the New River and other coal-mining rivers, the pattern is very similar, the bulk of the shelter elements being in lines along the narrow river terraces (Fig. 17). Where small manufacturing units, as in the south of Leicestershire, invade country districts, or quarrying develops near an agricultural village, as at Croft or Enderby in the same district, a type of village develops which falls intermediately between that of agricultural and mining areas, and the house-pattern map shows these villages as being too large for normal tillage areas. Such growth in the case of small-scale manufacturing is largely related to the lower rates of the counties, and the surplus labour available in the agricultural districts. The resulting villages are comparable to those larger nodes which Mademoiselle Lefevre has recognised as constituting a distinct village type in Belgium, and to which she applies the term 'con-

centration' to distinguish them from the normal compact type of agricultural village [16].

Comparable to these, and of a larger size, are the market towns and small administrative centres and a larger type of

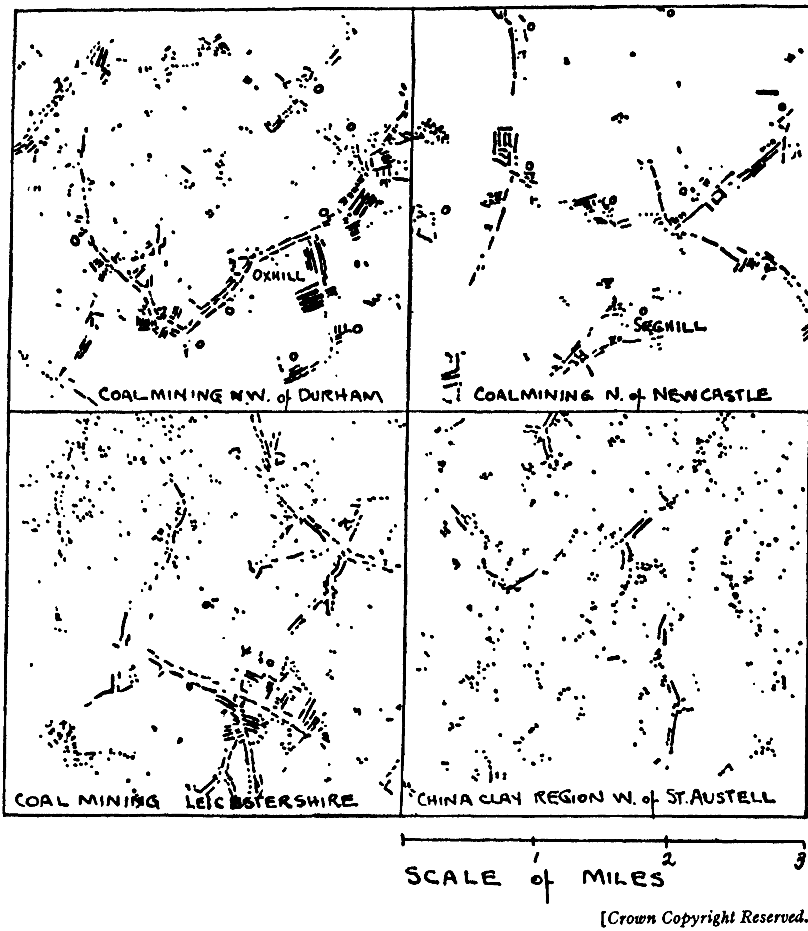


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FIG. 23.—ENGLISH MINING PATTERNS.

manufacturing town such as the salt towns of Cheshire. It is doubtful how far these intermediate types can be recognised from the house-pattern map, hence they have not been held to constitute a distinct pattern, although the general size of such towns can be clearly distinguished from the mining villages on the one hand and the large-scale administrative

and manufacturing towns on the other. Many interesting details can be recognised as to their shape, e.g. the double bridge-head towns such as Bedford or Stamford or Hertford, which developed on each side of ford and bridge, can be readily picked out.

7. *Large-scale Manufacturing Pattern* (Fig. 24).—The characteristic feature of this type is usually a dense mass of buildings, which may cover anything from about four to

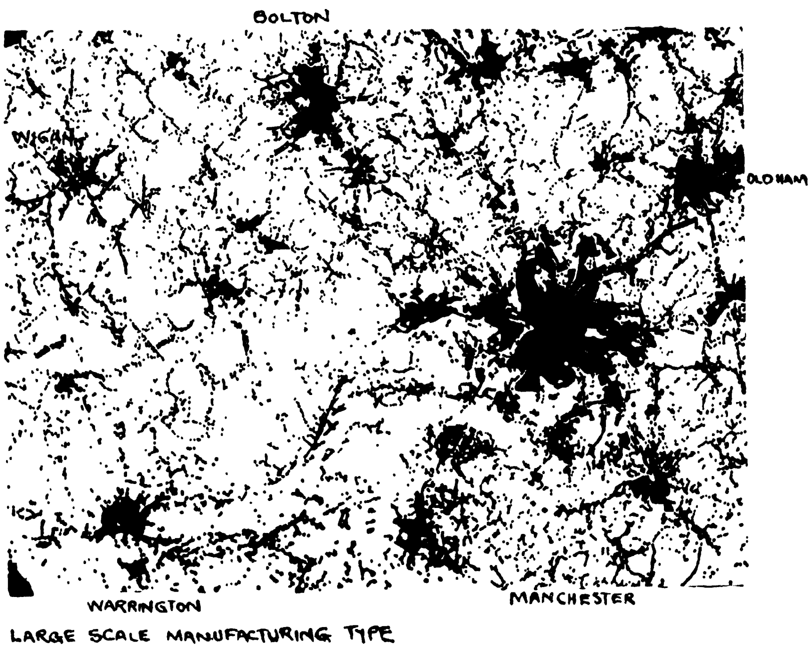

FIG. 24.—MANCHESTER REGION. DISTRIBUTION OF BUILDINGS.

forty square miles of area, with commonly a series of radiating arms extending out into the countryside. The general shape and appearance of such a pattern are discussed in Chapter 4. The pattern may be divided into two broad sub-types—the large single entity such as Leicester, Nottingham, Derby, Carlisle, Sheffield, or Rochester, U.S.A., and the large-scale manufacturing group of which the Manchester-Bolton-Oldham-Stockport group, the Darlington-Middlesbrough-Stockton group, the Newcastle-Tynemouth group, the Leeds-Bradford group, the Blackburn-Burnley group, the Potteries

group, and the Birmingham group are among the chief in England. This group is capable of further subdivision based on the characteristic arrangement of the pattern. Thus we have a definite linear pattern based on rivers, as in the case of Tyne and Tees, or topographical features, as in the case of the north Lancashire pattern; an irregular grouping based on coalfields and topography as in Yorkshire, or the Potteries, or the Pittsburg region; and a spider's-web pattern as in south Lancashire focusing on Manchester. We might also distinguish a loose coastal grouping as in South Wales or the south shore of Lake Erie—a zone where meet two types of raw materials. A study of these distributions brings forcibly to mind the extent of area actually occupied to-day by masses of houses. Manchester, including Eccles, barely fits two and a half times into the distance separating it from Liverpool. Leicester, including its suburbs, is not very much smaller than the Charnwood Forest, though a run through the forest gives a sense of size to such an extent that one feels it must be very many times greater in area than the city. Such a study also makes plain the amazing ribbon-road development round our large cities to-day. In the Manchester group one can pass from one large city to another and rarely if ever get a glimpse of any real countryside. The essence of this development is road settlement stimulated by the coming of the motor-car and the motor-bus. A statistical map based on administrative divisions obscures the detail within the administrative boundary, and therefore hides this modern development, but the house-pattern map makes it clear.

8. *Small Fishing Ports.*—We have referred above to one coastal pattern—that of manufacturing centres at the junction point of raw materials. Several other coastal patterns can be recognised. Dotted about on our coasts are small fishing villages such as St. Ives or Penzance in Cornwall. They tend to disappear and are not always as such distinguishable from the smaller seaside and residential centres.

9. *The Seaside and Residential Pattern* (Fig. 25).—The characteristic feature of this pattern is a series of centres

relatively close together strung along a coast line. They are usually, but not always, distinguishable from the small fishing port by their linear grouping, and by a certain amount of outlying suburban development based on roads or cliffs or streams. Of this pattern the coastal settlements of North Wales east of Llandudno, the line along the south coast from Worthing to Brighton, the Kent coast from Folkestone to the Thames estuary, and the Lancashire coast by Blackpool and Southport may be mentioned. The chief factor operating

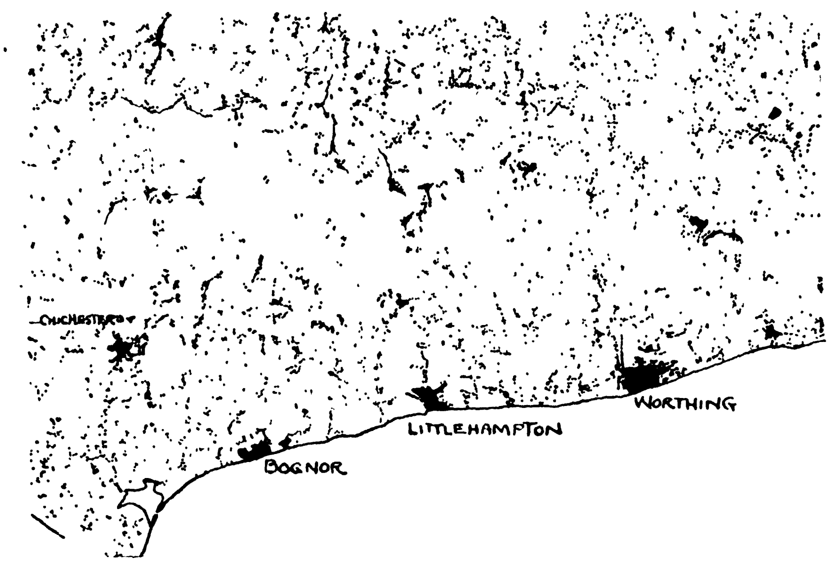

FIG. 25.—SEASIDE AND RESIDENTIAL PATTERN.

here would appear to be the presence of a coastal area providing recreational facilities. Sands, cliffs, sea, and climatic conditions seem to be the main environmental factors making a suitable environmental setting.

10. *Large Ports* (Fig. 26).—Among the coastal patterns we find the large single port as at Liverpool, Plymouth, Hull, and Southampton. This pattern is commonly slightly flattened at one side, with a radial or fan-shaped arrangement at the other. The extent to which this fan-shaped form holds good in individual cases depends largely on the configuration of the coast, the depth of water available, and the nature of the

hinterland. Both at Plymouth and Southampton the typical pattern is considerably modified.

Summarising, it appears clear that as far as England and Wales are concerned the following types or patterns are distinguishable: sparsely peopled country; grassland with possibly two subdivisions; tilled land, with possibly three subdivisions into poor land well cultivated, good land, and market garden or fruit land; mountain valleys which may be

LARGE PORT PATTERN DISTRIBUTION of BUILDINGS — LIVERPOOL DISTRICT

FIG. 26.

used for either grassland or cultivation or both; linear patterns mostly related to cultivation; mining country, particularly if the activity is coal mining; large-scale manufacturing areas, with possibly two subdivisions; and three coastal patterns which tend to merge. In between these patterns there are many mixed forms which tend to merge with other patterns and cannot always be distinguished. One of the chief difficulties in getting clear-cut patterns lies in areas where changes in the nature of the activity have taken place without equivalent changes in the settlement forms, as in regions of arable which

have been converted into grasslands, or in regions where the original settlement has expanded to take in poorer lands.

In spite of certain difficulties the patterns appear useful and very significant geographically. The significance of the pattern appears to depend mainly on two factors. The first of these is the relation of the buildings to each other, that is, whether they are arranged in single elements, in lines, or in groups, and the orientation of the lines and groups. Thus the significance of the grassland pattern depends on the arrangement in single elements chiefly, that of the tillage pattern on the grouping of the buildings into villages of a more or less compact character, and that of the various linear groups on the arrangement of the buildings or villages in lines. The second factor, which must be taken in conjunction with the first, is the density of the houses either as units or in lines or groups. Thus the significance of the fruit-growing pattern rests chiefly on the density of the individual buildings, that of the mining pattern on the density in lines, and that of the manufacturing pattern on the density of the groups. In general, it may be said that the appearance of the pattern depends largely on the first factor, while the density of the pattern depends on the second. The first factor corresponds, in a sense, to line work and texture in a sketch, while the second factor corresponds to shade. The first factor is in a general way of prime importance, since, even in a manufacturing pattern, the linear road arrangement plays a large part in determining its characteristic appearance.

There appear to be four main factors producing these characteristic patterns of settlement. The first of these is the number of people. This fact largely governs the density of the pattern. The second is the type of activity carried on. The third is the time-period factor, including the historical development of the activity, the time at which it is carried on, the knowledge and ability of the people to use the land in a certain way, and the ethnic and traditional 'make-up' of the people. These two factors have much influence on the arrangement of the pattern. Lastly, there is the environmental complex,

working in the buildings, but with the area occupied by the buildings. The number of people occupying buildings on a given areal base varies in different parts of the country with different types of land occupancy, with the nature of the activity carried on, and with the custom of the district. Thus in the large farmhouses of the highly tilled districts there are more people than in the smaller farms of the grass country. This is partly offset, since our map shows buildings and not just dwellings, so that the additional barns, etc., of the large farms are shown.

The difficulty becomes greater when we attempt to compare towns and cities. In cities like Glasgow, where the flat and tenement system is highly developed, there are many more people to a given area than in cities like Liverpool. A study of the house-pattern maps of the two cities does not bring out clearly the much greater population of Glasgow. If we desire an extreme example, we take New York, and point out the impossibility of indicating, by this method, the population of New York adequately as compared either with the sprawling cities of the prairie or with old-world cities. Apart from such exceptions the relative sizes of cities are indicated by this means in an area such as England.

Just as radio fails to transmit the full musical scale, so there is no known method of presenting the distribution of population which adequately represents on the same map the population of cities and country districts. The method of density per administrative unit, or that of dots arranged within the administrative area, not only fails to give a satisfactory comparative representation, unless resort is had to a series of globes, but it completely destroys the characteristic form of the pattern, the shape and appearance of the city, town, or village. This appearance and shape is usually very suggestive, and is directly related commonly to both the activities and the physical setting in which those activities take place. The characteristic grouping round Manchester, the Leeds–Bradford grouping, and that of the Potteries, for example, are intimately related to the environment. The density method

destroys the appearance of this grouping; the house-pattern map makes it clear. On an ordinary population map, the major centres of manufacturing industry appear as crude shapes in areas with over 512 people to the square mile. On the house-pattern map they stand out clearly with characteristic shapes which are very significant geographically.

The house-pattern map chiefly shows where people sleep. It shows where they work if they work indoors. In the country districts the bulk of the work is done out of doors. In the towns and cities people mostly move from their homes to factories, warehouses, offices, and shops. Therefore the house-pattern map based on area occupied by buildings tends to indicate them twice over. Since the map normally has the effect of exaggerating the number of people in the country districts as against the towns, the over-emphasis of the cities which we have just discussed, being in the opposite direction, tends to offset the exaggeration.

A further source of error lies in the date of the map. The source of the house-pattern map is usually the 1-in. O.S. map of the district. The buildings shown are thus those in existence at the time of the survey or last revision. The ½-in. map is so old that it is not of much use for this purpose, although the scale would be preferable. The new ¼-in. map would be just what is needed from the standpoint of scale, but does not give the required detail. Although the 1-in. map may in some districts be ten years out of date, we have to remember that the census figures are only available at decennial periods, though they possess the advantage of representing the whole country at the same time. A useful exercise in the field is to bring the house distribution up to date when studying a small area.

There are other minor defects of the house-pattern method regarded as a means of showing population density. Most of these it shares with other methods. The disadvantages tend to be offset by the marked advantages of the method regarded not merely as a population index, but as a geographical index. As a geographical index the method appears to be distinctly

valuable since, owing to its closer relationship to the physical environment, the extent and shape of the area occupied by people are of greater interest geographically than the *exact* numbers of people in the area.

The house patterns are facts which exist apart from the explanation of those facts. They show precisely where people live. They thus state concretely a problem which invites explanation.[1] Since they represent in objective form man's most universal response to his environment in satisfying the need for shelter, they state the problem of the distribution of population more flexibly and sympathetically, having regard to the physical setting, than any other form of population map, particularly in rural districts.

For these reasons the writer has found, as a matter of practical experience in teaching, that the house-pattern map of a small area is the best available starting-point for the study of that area. Since the study of any natural area is carried out, from the standpoint of human geography, with the relationship of man to that environment as the objective, man's activities, rather than the physical setting, are best taken as the first object of study. Man's activities are clearly before the student in the features of the cultural landscape. A study of the natural environment as such involves a study of many things having little or no relationship to man. In human geography, if the natural region is the first object of study, it can only be undertaken with man's use of that area in the back of one's mind. If one desires to measure cloth, one first gets or makes a measure. Then why not in geographical work make one's criterion, or measuring rod, definite and concrete instead of dim and hazy? This can be done by first constructing in one's mind, through direct study, a picture of the way in which man has utilised the environment. This use is clearly seen in the features of the cultural landscape. To get our measuring rod they should be the first object of study. In them the most obvious and universal form, apart from man himself, is

[1] It is clear from what has been said already that *similar* patterns may reflect *differing* environmental settings.

the shelter in which man lives, and near which or in which he works. While such an element as a railway track or a corn-field is related to a specific form or forms of human activity, the house or building is related not to one but to all forms of human activity. Its erection modifies and is modified by the natural landscape ; its distribution is intimately related to that landscape. The house-pattern map is thus probably one of the best *single* all-round objective expressions of the relationship between human activity and the physical setting in any region. As it puts flexibly and sympathetically, in simple form, one of the chief problems of human geography, that of man's distribution, it may be regarded as the simplest available commentary on the adaptation by man of his environment, and a convenient jumping-off place for the study of that adaptation.

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Chapter 8

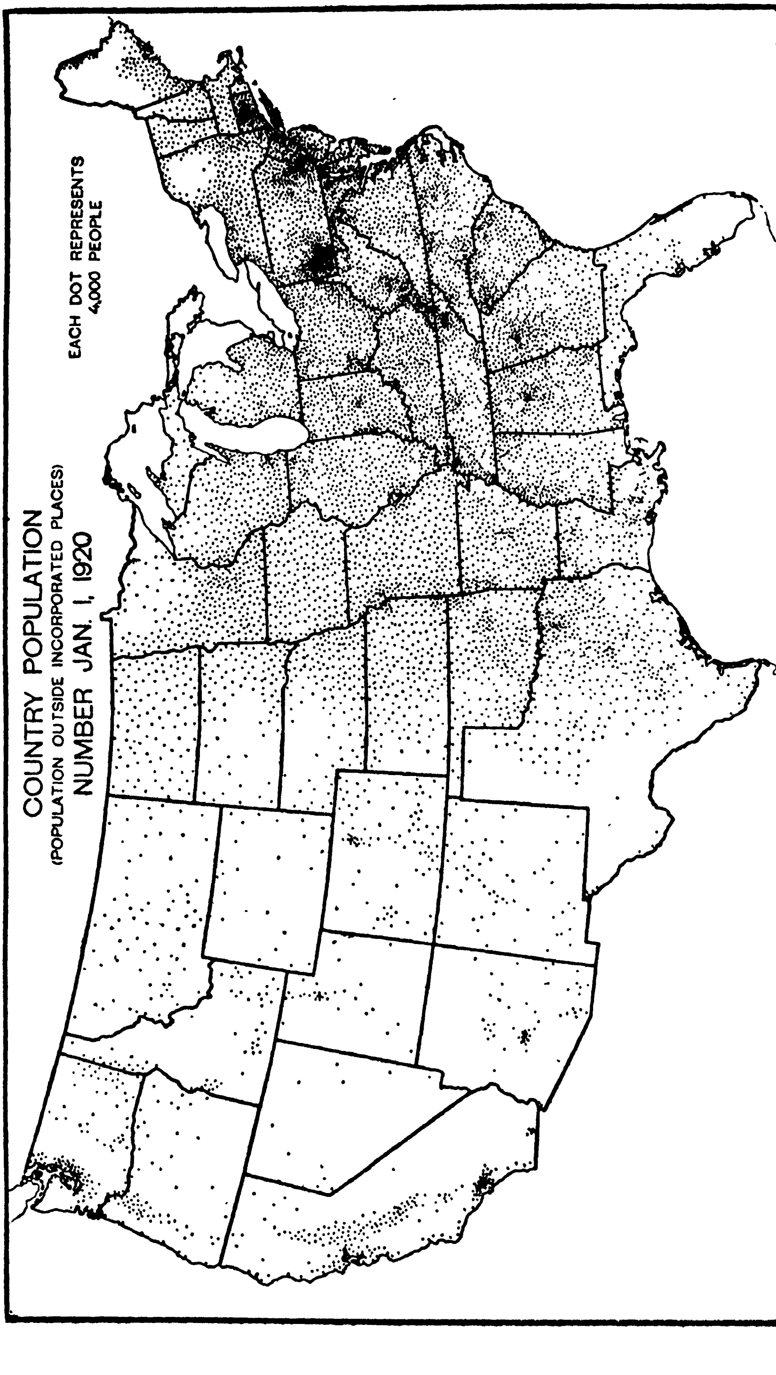
THE CULTURAL LANDSCAPE OF THE CORN BELT

The cultural landscape considered as an adaptation of nature in the effort to satisfy the desire for food and raw material, and to provide an outlet for surplus population. A detailed study of the Corn Belt of North America.

THE cultural landscape produced in the effort to satisfy the demand for food in most regions takes the form of fixed elements of which houses, barns, fields, fences, roads, and railways are the chief, and of movable elements of which growing crops, livestock, vehicles, machines, and men are the most important. The character of these elements varies, as we have seen, in response to the nature of the activity, the environment, and the time-period factor. In addition, in most areas there are specialised elements not found, or only found in a markedly modified form in others. In the Corn Belt of North America the facts of the cultural landscape are very simple and very obvious. It therefore forms an admirable area to illustrate man's adaptation of nature in the effort to satisfy the desire for food. Let us first examine the main forms of the cultural landscape and then the process of adaptation which has produced it.

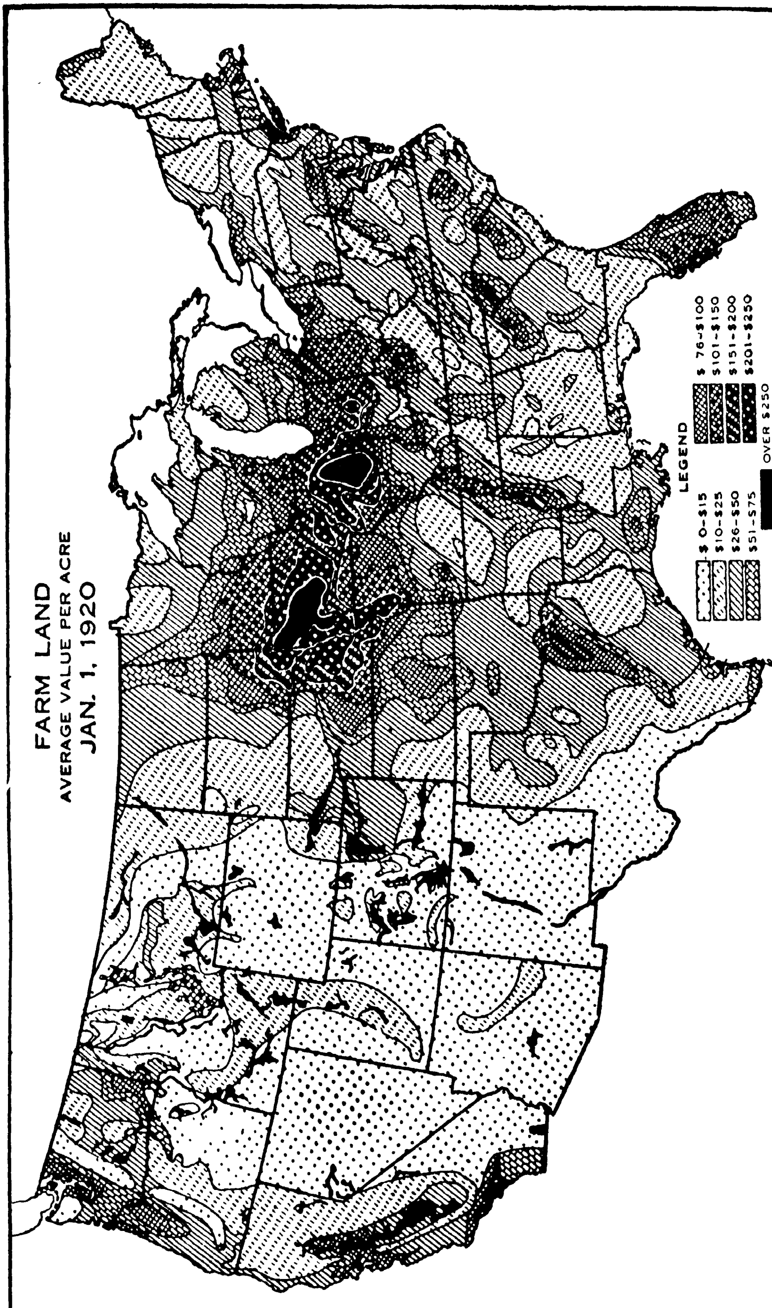
The rural population of the central part of the United States is fairly evenly distributed. This even distribution masks rather than elucidates the main facts of human activity. There is little on the population map to indicate the Corn Belt (Fig. 27).

A study of the average value of farm land per acre (Fig. 28) presents a very different picture. As a result of such a study an east/west belt of country running through the states of Iowa, Illinois, and Indiana stands out clearly. In this belt the value of farm land per acre is over $100, varying from



[*Courtesy, U.S. Dept. of Agric.*]

FIG. 27.—RURAL POPULATION, U.S.A.



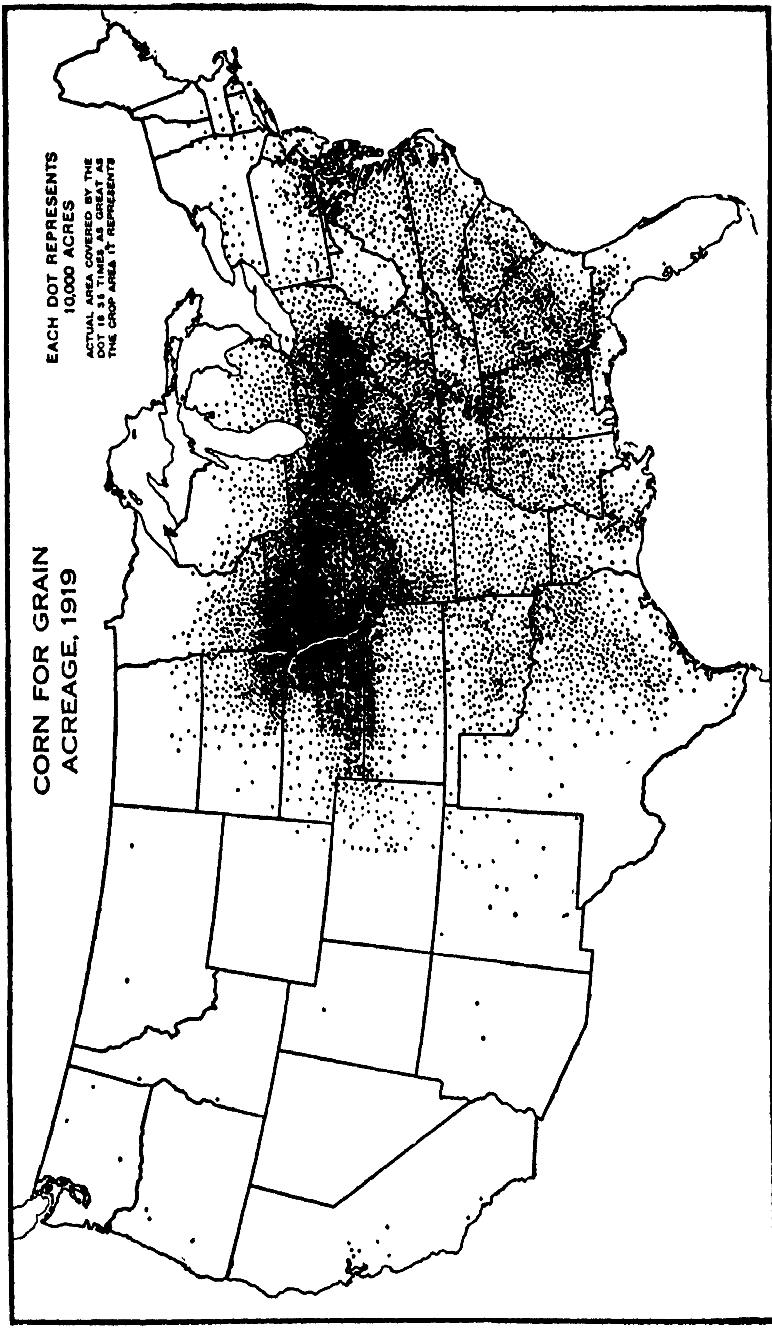
[Courtesy, U.S. Dept. of Agric.

FIG. 28.—VALUE OF FARM LAND, U.S.A.

$104 in Indiana to nearly $200 in Iowa. In certain parts of the states of Illinois and Iowa it rises to over $250. In all other states the average value of farm land per acre falls below $100 [1]. These facts may serve to focus our attention on the activities of the people in this region—the richest agricultural zone in North America—and on the natural environment which conditions these activities.

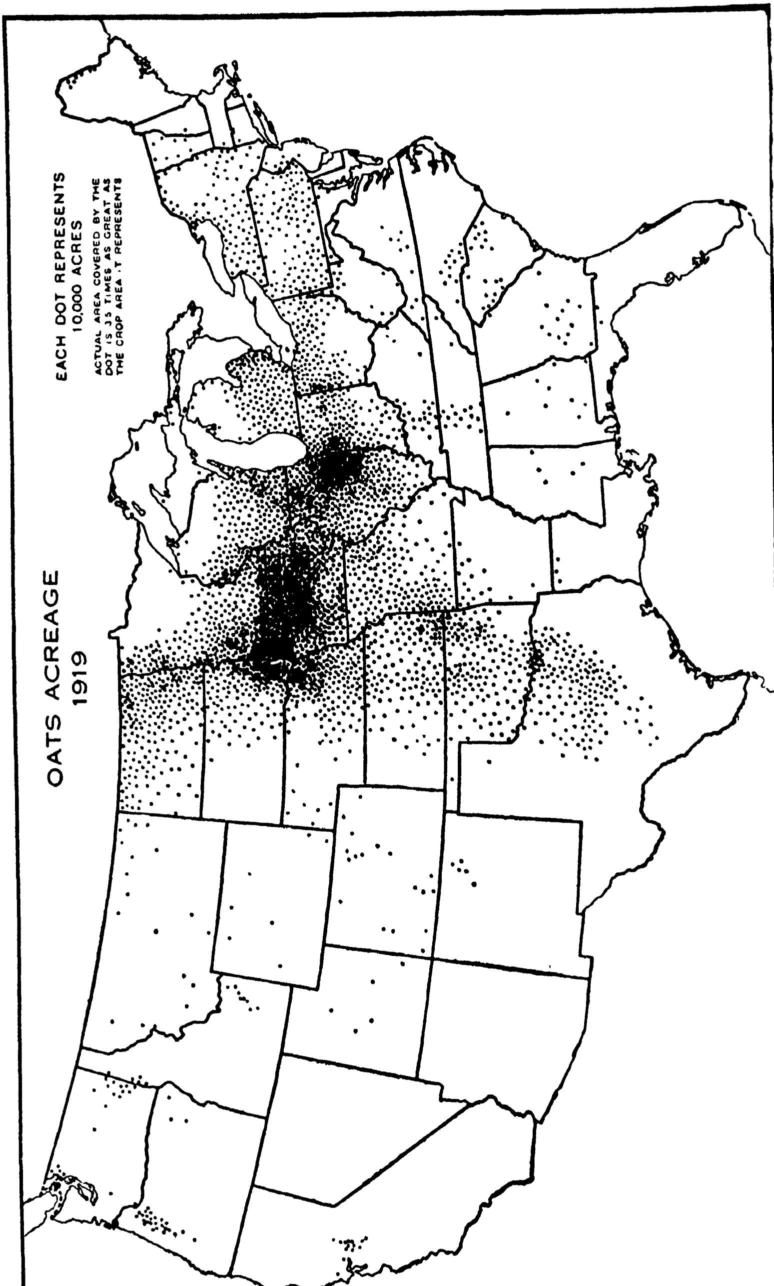
Chief among these activities is the growing of corn, or maize, to give it its proper title (Fig. 29). Corresponding roughly to the zone in which the value of farm land per acre is over $100, we find an area where corn production is very heavy. This zone, usually known as the Corn Belt, begins in the western part of the State of Ohio, and runs eastward through Indiana, Illinois, Iowa, northern Missouri, south-eastern Dakota, eastern Nebraska, and northern Kansas. The Corn Belt is commonly misunderstood to mean that part of the prairie where corn is the dominant crop, meaning thereby the area in which corn occupies a larger acreage than any other crop. The term 'dominant crop' should here be understood to mean the chief crop in the system of farm economy practised without reference to the proportion of acreage occupied by the crop. For example, there are certain parts of the Cotton Belt in which the acreage under cotton is less than that under corn, nevertheless cotton is much more important in the agricultural economy of those areas than is corn. In parts of Illinois, a typical Corn Belt state, over 50 per cent. of the land under cultivation is in corn, but in other parts of the Belt the percentage may fall as low as 30 per cent., the main crop in the system of farm economy still being corn. Within the Belt is raised rather more than one-half of the total corn crop of the United States, which produces about three-quarters of the world's total.

Corn normally grows to a height of eight or nine feet (Fig. 37), yields from 50 to 100 bushels to the acre, and in addition to the value of its grain, its vegetative parts are of great value as fodder. Under the existing environmental conditions in the Belt, corn gives the largest money yield of



[*Courtesy, U.S. Dept. of Agric.*

FIG. 29.—CORN ACREAGE, U.S.A.



[*Courtesy, U.S. Dept. of Agric.*

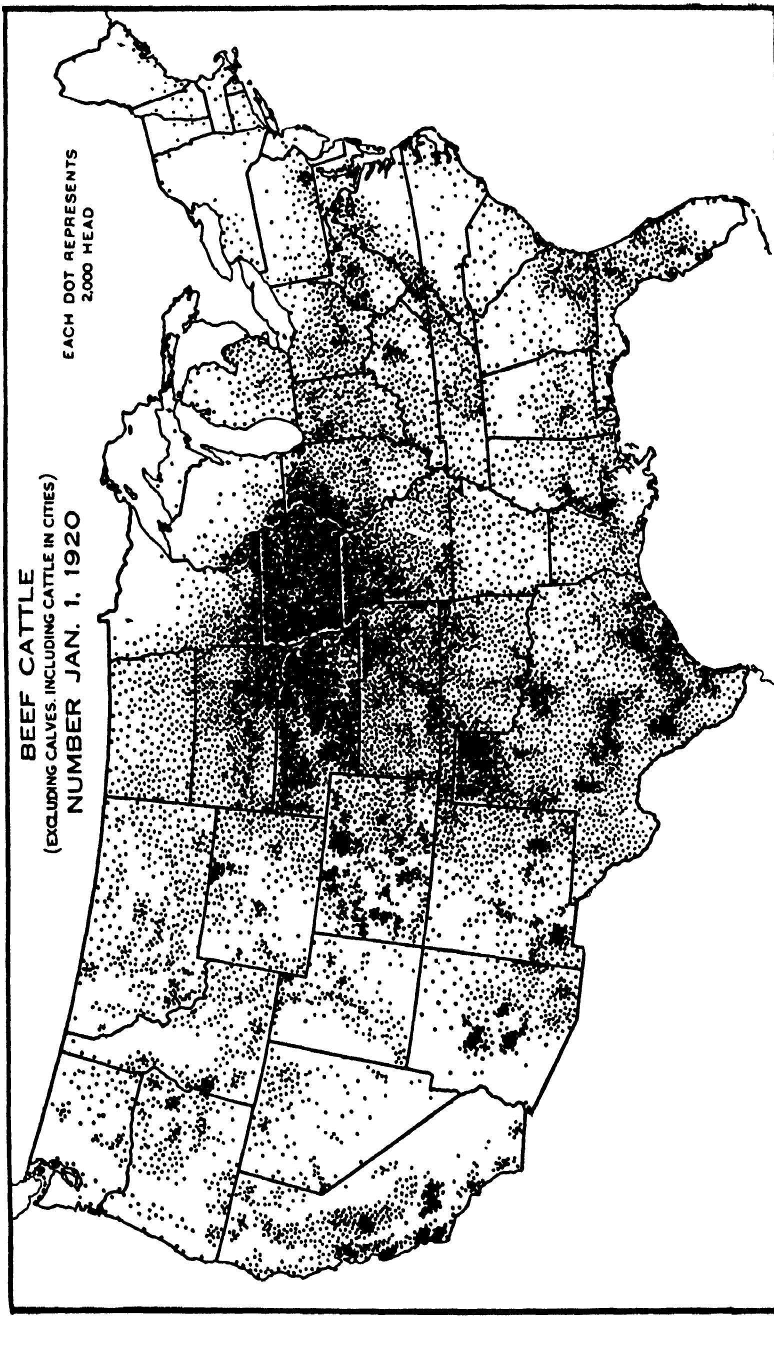
FIG. 30.—OATS ACREAGE, U.S.A.

any of the cereals, and thus occupies here the place held by cotton in the Cotton Belt and wheat in the north-west.

Although in the Belt everyone thinks in terms of corn, corn in most of the area, with the exception of the bottomlands, takes its place with other crops in a system of rotation in which oats or wheat and clover or alfalfa also play their part. The Oat Belt of the U.S.A. to a large extent coincides with the Corn Belt (Fig. 30). Probably the commonest rotation in the Belt is that consisting of two years' corn followed by one year of oats or wheat, and one year of clover. The clover seed is sown at the same time as the oats, but is not harvested until the following year.

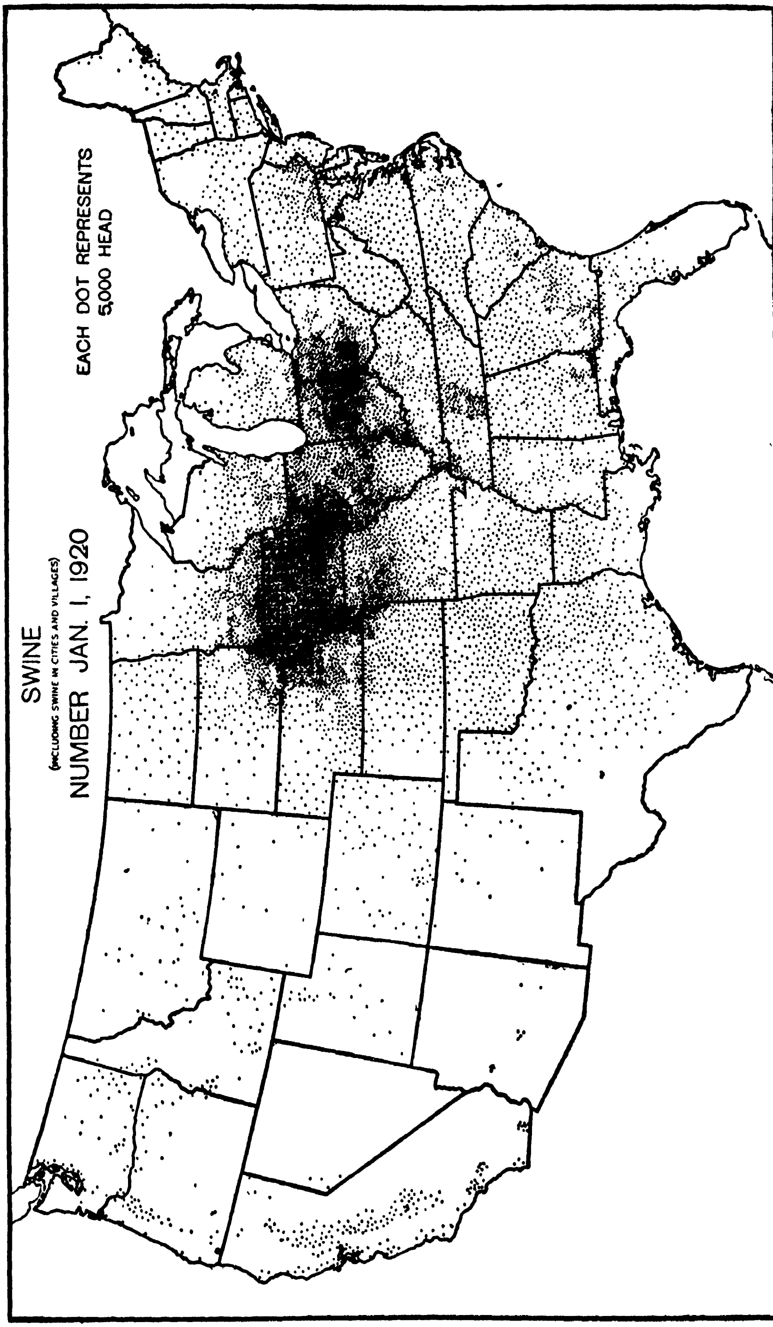
These small-grain crops, as oats and wheat are termed, and the clover crop, fit well into the labour schedule. Oats are sown in March and April. May and June see the planting and cultivation of the corn. By July the corn is tall enough to choke with its shade the principal weeds, and cultivation being no longer necessary, labour can be devoted to the harvesting of the oats in July and early August. This work is then well out of hand before the corn husking in the fall. The other crops also fit in and provide useful feed and cash crops early in the season. The clover also helps to maintain fertility through renewing the steadily decreasing nitrogenous content of the prairie soils. A good corn belt rotation therefore does not unduly emphasise corn. This is well brought out in the man-labour-hour studies made during the war at the University of Illinois.

A view from one of the low morainic elevations of the central Illinoian prairie shows the different crops. The Corn Belt typically has some four farms to the square mile, the average size of each being a little over 160 acres. From such a viewpoint near Bloomington (Plate 14), in the heart of the Belt in Illinois, the writer counted some forty-three farms. These were clearly to be distinguished by the white farmhouses with their red outbuildings surrounded by clumps of trees. By inspection one could roughly estimate corn to occupy some twice the acreage of the small grains, showing



[*Courtesy, U.S. Dept. of Agric.*

FIG. 31.—BEEF CATTLE, U.S.A.



[Courtesy, U.S. Dept. of Agric.

FIG. 32.—SWINE, U.S.A.

up well in dark patches against the wheat and oats which by early August are cut and stooked, and sometimes threshed. Among the oat stubble in the foreground, timothy for next year's hay crop was clearly seen. Such general views are exceptional in the Corn Belt because of the absence of elevations.

Livestock, chiefly beef cattle, hogs, and horses are seen on most of the farms. They are markedly concentrated in the Corn Belt. Beef cattle attain their maximum density in the central and western parts of the Belt (Fig. 31). They are also commonly found close to the main lines radiating out from Chicago. They lose more in condition in railroad transportation than do hogs, hence they are fattened for preference close to a main line and within a night's run of a great central market such as Chicago. Many typical herds of this kind are to be seen in the vicinity of the main line of the Chicago and Burlington Railroad not far from Galesburg, some 150 miles from Chicago.

Hogs are also concentrated in the Belt to the extent of about two-fifths of the total number for the U.S.A., the density being about four times that in any other section of the country. Both cattle and hogs are fattened on corn and kept on a rotation grass pasture, though they may be found on permanent grass where the land is unsuitable for cultivation. Corn contains more oil than any other cereal. It is thus excellent for fattening. Since hogs are essentially grain-eating animals, while cattle are grass eaters, pig-meat is the most concentrated form in which the corn can be marketed.

If such a thing as a completely typical Corn Belt farm existed, it would probably carry from 100 to 130 hogs, from twenty-five to thirty head of cattle, and have about eighty acres in corn, forty in oats and forty in clover or hay. Actually some one of three possible forms of farm economy or activity is usually dominant on the Corn Belt farm. The dominant type usually varies in response to the physical setting, using that term in its widest sense, though as between dominance of cattle and hogs one must allow to some extent for the whim of the individual farmer. The first of the three possible

forms is the growing of corn for sale as grain. Such farming is very common within a radius of 100 miles of Chicago and in parts of the Belt close to a consuming centre. The other two major forms of farm economy are the corn-hog combination and the corn-cattle combination. In these cases corn is grown primarily as feeding-stuff for the animals. About one-half of all the corn is fed to hogs. Along the northern edge of the Corn Belt, dairy farming based primarily on fodder-corn is extensive, and it exists as a minor form of activity within the Belt in proximity to the cities. Everywhere coupled with these major activities is found the growing of small grains and clover, partly for sale and partly for additional feed. As all these many types of Corn Belt activity are found in Illinois it may be considered as a typical Corn Belt state, though the hog-corn combination reaches maximum development in Iowa.

This farming activity finds expression in the cultural landscape. The farm buildings, fields, fences, and roads constitute its anatomy; the livestock, crops, vehicles, farm machines, and man make up its physiological features. Much can be done to picture this cultural landscape from maps and statistics, but adequate appreciation of it can only be obtained from personal visits or from an elaborate series of illustrations. Even on a comparatively rapid reconnaissance, run by car with judicious stops for soil studies and talks, one can distinguish the main regional types of activity in the Belt.

The numerous silos, those tall tower-like structures, in which green corn is stored for winter feed, alongside the great hay barns, closely identify the typical dairy country (Plate 14). A further indication is the barbed-wire fence, the presence of the dairy herd, and the milk cans in the farmyard. The typical hog country is even more definitely indicated by the numerous hog fences, the close, woven wire of which is a characteristic element. Other elements of the landscape are the low hog shelters which remind us of an overgrown dog kennel, and the long, low sheds which are sufficient to shelter the hogs kept during the winter (Plates 14, 15). Lastly, the presence in

the fields of the gentleman who, here as in Ireland, largely helps to pay the rent, is evidence which, though of a seasonal character only, is none the less decisive. In the cattle country the barbed-wire fence is cheaper and more effective than woven hog wire, and was invented in the Belt for the purpose to which it is put. The great hip-roofed hay barn, so built to carry more hay than the V-shaped roof, is also a cattle indicator, and is clearly to be distinguished from the slotted corn barns of which the circular tile-built type represents the most recent practice (Plate 15). Corn is stored without previous curing, hence the need for slotting for ventilation to prevent decay. In the hog country these hay barns are small or absent, but a typical feature is the corn crib. To the expert eye the different landscapes of the major forms of activity are as clear as is the difference between a Chinaman and a European to the inexpert.

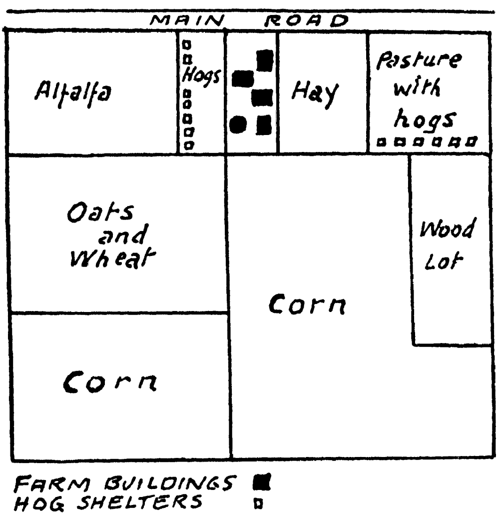


FIG. 33.—DIAGRAM OF CORN-BELT FARM LAYOUT.

A typical farm layout, as seen from one of the fine concrete main roads now to be found throughout most of the Belt, shows the white house close to the road, nestling in its clump of trees for shelter and shade, with red-painted barns for corn and hay, sheds for livestock, and other outbuildings around the farmyard (Plate 15). Either in, or close to the yard, the tall windmill for pumping water is a conspicuous feature (Plate 15). Behind and around the buildings, is the farmland, divided into four to six fields and one or more woodlots. In July the field of small grains is either in stubble or covered with grain in stook

(Fig. 33). Nearby is a clover field and a rotation pasture with hogs. In late July or early August, the threshers are at work on the small grain harvest, and from the threshing machine a great cloud of chaff from the blower mounts into a heap ready for burning. A small orchard is near the farmhouse. From it comes the main ingredient for the apple pies for which the Belt is famed.

Such a farming community may be regarded as a functioning organism whose activity is not confined to the growing of a particular crop or the pasturing of animals. It is rather a highly complicated piece of mechanism, the operations of which vary markedly with the season and with the natural environment, and may range over several crops and sorts of animal husbandry. A study of a labour calendar such as that prepared for a typical part of the Corn Belt in central Illinois by the Department of Farm Organisation of the University of Illinois, shows how very diversified and complicated these operations may be. If we select from such a calendar some of the more salient activities, we note the ploughing of spring followed by the sowing of oats, wheat, clover, and alfalfa. Early summer, when all danger of frost has passed, sees the planting followed by the cultivation of the corn. In July and August corn cultivation has ceased, and the harvesting of the small grains demands attention. Autumn sees the fall ploughing and the husking of the corn. This latter is commonly done by hand, but the use of machines for husking is increasing [7]. The husking usually begins in the middle of October and extends to January, but the greater part of the crop is harvested by the end of November. Migratory labour is extensively used for this work. Side by side with this general activity, connected chiefly with grain, we have the manifold duties of tending and feeding the animals, so that the corn, the great backbone of the whole system, may be marketed, not in the form of grain, but in the form of pork, beef, poultry, milk, and even eggs.

An integral part of this organism is the small town, of which Princeton or Galesburg, both in Illinois, are typical

examples. The streets are well kept, broad, and flanked by fine stores and hotels. To such centres the farmer comes to market his products, to meet buyers, or to arrange a loan. The spidery prairie four-wheeler he hitches to the hitching rail (Plate 15). This picturesque vehicle has largely given place to the Ford, its direct descendant, built like its ancestor on spidery lines to negotiate the rutty pre-concrete prairie roads. Farm products are universally handled in the Belt in the box-form prairie wagon, whose capacity can be readily altered to suit the many varying products, both animal and vegetable, of the Belt. There is a general air of prosperity and of invincible optimism about these towns. Handling the products of the richest of farm lands, and supplying the farmer with the many articles and services to which his surpluses entitle him in exchange, the prairie towns are well-to-do and look it. Such prosperity is reflected in the beautiful residential districts with their wide, well-tended roads, grass verges, and concrete paths, with great trees planted by the early settlers, and splendid houses undisfigured by fences. To these residential districts the successful farmer retires; leaving maybe his son to run the farm.

Such a farming community, then, is a complex organism in process of adapting its natural environment. This adaptation is a slow process of growth which we can only briefly consider here by glancing at certain stages in the settlement of the State of Illinois and at the natural environmental condition when settlement began.

The terrain in which this farming community has developed is for the most part the slightly dissected boulder clay plains formed from the ground moraine of a series of glaciations. Here and there, running sympathetically to the south-western end of Lake Michigan, terminal moraines [8] form belts of higher ground wherever the ice stood for some time. An excellent example is the one at Bloomington from which we looked out over the Corn Belt.

The rough topography of pre-glacial days was entirely buried under some 200 feet of ground, moraine or drift form-

ing a smooth surface so far only slightly dissected by the present streams. At the coming of the first settlers the state lay in three sections (Fig. 34): upland prairies, upland timber

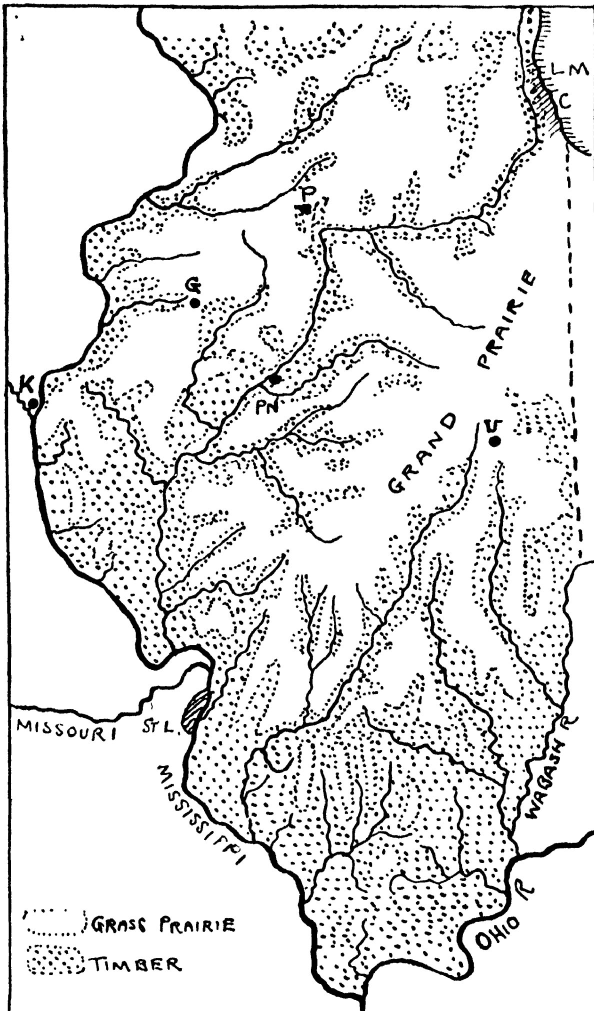


FIG. 34.—SKETCH-MAP SHOWING GRASS PRAIRIE AND TIMBER IN ILLINOIS.

land, and river bottomlands. Grassy prairies covered the inter-stream areas. The timber country was round the edges of the prairies and in the river valleys. The bottomlands were along the flood plains of the larger streams.

It is thought that with the retreat of the last ice sheet, grass first took hold on the upland areas, which had been covered deep in glacial debris. Trees followed later, but developed first in the river valleys, where abundance of drainage, plenty of water, and some shade were available. Later, as dissection proceeded, parts of the prairie became more suitable for tree growth, and the trees spread from the valley slopes up on to the prairie edges. When man came they were slowly creeping outward on to the prairie a foot at a time. The tiny saplings, which would have died unprotected during the long dry spells on the open prairie, flourished under the edge-shade of the slow outward marching front of the timber. These saplings everywhere do well on the valley slopes, where water is more abundant through underground drainage. Given time, no doubt the timber, plus dissection, would have conquered the prairie.

As a result of these processes we have on the upland prairies to-day two main soil types—the upland prairie soil, found where natural timber has never grown, and the upland timber soils, where trees once flourished but were cut down by the settlers. The upland prairie type of soils " usually occupy the less eroded areas of the upland. They are black or brown in colour owing to their high organic matter content. The flat, poorly drained areas contain the greater amounts of organic matter owing to the more luxuriant growth of the grasses that grew on such areas and to the excessive moisture in the soil, which provided conditions better adapted for the preservation of their roots " [9]. Decay of grass roots maintains a relatively high organic matter content in the soil. It has been estimated that an acre of this soil to a depth of 7 inches contains 13½ tons of roots [10].

The upland timber soils include nearly all areas that are now or have been covered with forest. " These soils contain much less organic matter than those of the prairie. In forests the vegetable matter from trees accumulates upon the surface and is either burned or suffers almost complete decay." Leaves oxidise almost completely and the roots of trees do not

decay. "Grasses which furnish large amounts of humus-forming roots, do not grow to any extent because of the shade. Moreover, the organic matter that had accumulated before the timber began growing is removed . . . with the result that in these soils generally the content of nitrogen and organic matter has become too low for best growth of farm crops" [11].

On the edges of the timber to-day in certain places trees are found growing in a soil essentially of the upland prairie and not of the upland timber type, that is, on a soil whose nitrogenous content is high. The obvious inference is that where timber has grown for a long period, the soil has been deprived by the trees of its original fertility, but where timber has only been growing for a short time no such change in the character of the soil has had time to take place.

Thus the distinction in origin between the upland prairie and the upland timber soils makes clear their different economic significance to-day. The prairie grass roots partially decaying maintain a relatively high organic matter content in the soil; the upland timber soil is relatively poor in nitrogenous material. A study of the plant food in the soils of McDonough County, Illinois, as set out in Soil Report No. 7 of the Agricultural Experimental Station, maintained by the University of Illinois, makes these facts clearer. The typical upland prairie soils called Brown Silt Loams, which cover some 55 per cent. of the area of the county, contain on the average in each 2,000,000 lbs. of surface soil, some 4,260 lbs. of nitrogen, while the typical upland timber soil, which covers some 25 per cent. of the area, contains in the same quantity and depth of soil only 2,140 lbs. of nitrogen, or approximately half that of the upland prairie soil. There is further a great reduction in the phosphatic content, making this soil much poorer also in what is probably the second most important element of plant food.

It is clear to us, then, that the grass prairies are much more fertile than the timber country. To the early settlers coming from the woodlands of the east, the exact reverse appeared to be the truth. They settled, therefore, in the thirties of the

last century, along the line of the navigable streams and in the timber country; along the navigable streams for ease of transport to market, and in the timber, partly because it was near the streams, and partly because they had wholly false ideas about the prairies. To them the prairie was like a trackless sea, and they feared that if they left the friendly shelter of the timber, they would be lost. We should recollect that the prairie in summer was covered with tall 6-foot grasses. In autumn the dried grasses were a constant fire menace, and in winter there was exposure to bitter winds against which there was no protection. Later, the newcomers argued that since no trees grew there the soil was infertile. There was little water on the surface, though had they but known it, water was available in great abundance below. Hence, the windmills and gasoline pumps of to-day. The early settlers also needed the timber for fuel, for their buildings, and for fencing. With their primitive implements they found the breaking of the prairie sod a task beyond their strength. Thus the country first settled was the wooded dissected country, mainly oak, which fringed the streams and edges of the prairie upland [12]. This dissected country is well developed where some of the larger streams approach each other, as along the water parting in the angle between the Illinois and the Mississippi rivers.

In the vicinity of Crooked Creek between Macomb and Carthage the two types of timber country in which settlement originally took place, are seen. The more fully dissected country (Plate 16) on the edges of the valleys was settled first. Later as settlement spread, the timber country in the flat upper part of each little tributary valley was taken over (Plate 16). Except for the presence of timber and the relative soil poverty, this area is almost identical with the grass prairie. Bit by bit the settlers pushed out into the edges of the timber, and the larger prairies—the largest of which is known as the Grand Prairie—were slowly surrounded by a ring of farms.

As reflecting the general attitude of mind among the settlers in those early days, an interesting record is available.

We quote from Barrows's account of the settlement of the middle Illinois valley: "In 1836 Alby Smith, living near Princeton, became a candidate for the legislature. He had made a farm on the prairie although locations in the edge of the timber were still available, and had expressed the opinion that ultimately all the prairies would be cultivated and crossed by railroads. The people of the district decided that a man holding such wild, visionary ideas was not fit to represent them. He was accordingly dropped and Thomas Atwater of Hennepin elected" [13]. He thus paid the common penalty of those who see a little ahead of their neighbours, which was all the more remarkable in view of the fact that the people who so treated him were themselves pioneers and farsighted in coming to the region.

Bit by bit, however, the prairies were conquered by other farsighted men who cared little for their settled neighbours' opinions. Farms developed with holdings partly in the timber and partly in the open, and with the development of railways in the 'fifties settlement of the larger prairies became easier. Corn became the staple crop because it was easy to cultivate, gave heavy yields under the existing climatic conditions, and could be harvested with the scanty labour available slowly over a long period. It was also easily stored, readily prepared for food, and was very nourishing for both man and beast.

To-day all the best farms are in the open prairie. Timber is planted to supply such fencing and firing as is needed where coal is not obtainable. It also gives shelter from the bitter winter blasts, which are the most disagreeable feature of the climate. To-day the prairies are highly cultivated, crossed by fine roads, and are a veritable sea of corn. To Iowa belongs the proud title of "The land where the tall corn grows," but to European eyes, the whole Corn Belt is the land where the tall corn grows. Stately, magnificent, it lifts its head eight to ten feet high in the harvest season. Those vast ranks of tall corn blowing stiffly in the wind, with a rustle as of a great army of silk dresses, have an inexpressible dignity of their own, which, racy of the very soil itself, seems, in some mystical way,

to epitomise all that prairie country of the Middle West, with its trim workmanlike towns, and courteous, lovable people. A fanciful picture one may say, but no, it is but the feeling inspired by contact with the thing itself, rather than the dry and distant impressions with which we have so often to content ourselves.

The true prairie country, mile after mile, is almost as flat as a billiard table. Of it the district to west of Macomb in west-central Illinois, is typical [14]. Spot heights of 694 and 698 feet are about one mile apart (Fig. 35). The gradient is quite imperceptible. A soil map [15] shows the upland timber soil following the creeks and streamways with a small patch of bottomland. The wide-spreading prairie east of Macomb has upland prairie soil, and within the badly drained areas, patches of Clyde soils very rich in nitrogenous matter. On these upland prairies the soil depth averages 200 feet. From the standpoint of crops, it is only the few feet near the surface which counts, and it is in this surface profile that are found the differences which distinguish the main soil types. A short distance below the surface in most prairie soils there is a hard layer, called claypan or hardpan, which checks the downward movement of surface water. This prevents crops from suffering too severely in dry weather. Where, as in the western part of the Belt, this layer approaches too close to the surface, plant growth is stunted and the yield decreases.

One of the main problems facing these prairie soils to-day is the rapidly decreasing nitrogenous content due to the improvident methods or lack of methods practised in the past. One hundred bushels of corn take from the ground 100 lbs. of nitrogen, in the grain, and in the straw some 50 lbs. [16, 17]. A fifty-bushel wheat crop removes in the grain some 71 lbs. of nitrogen, and 25 lbs. in the straw. Continuous cropping therefore steadily reduces the nitrogenous content, and the other plant-food elements are reduced in proportion.

Normal climatic conditions in central Illinois permit a production per acre of 100 bushels of corn or oats, or of 50 bushels of wheat, or of 4 tons of clover hay, where the needed

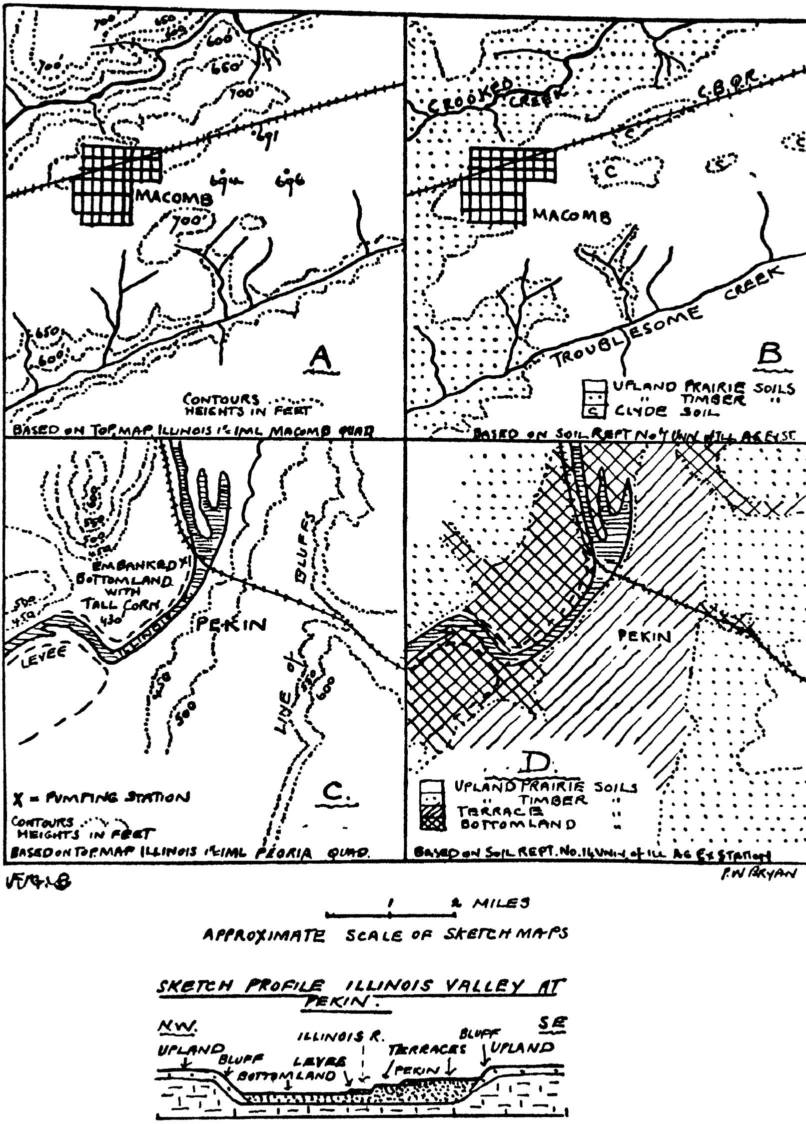


FIG. 35.—SKETCH-MAPS AND PROFILE OF PART OF ILLINOIS.

plant foods are present in sufficient quantities, and are liberated at a sufficiently rapid rate, on land properly drained and tilled [18]. In actual practice the 100 bushels to the acre corn crop is often produced under suitable conditions. The commonest upland prairie soil contains enough nitrogen for continuous cropping for maximum crops for forty years. These, then, are the chief elements of the nitrogen problem on the solution of which the farming of the area depends.

To maintain fertility, nitrogen and other plant foods are supplied to the soil in three chief ways—as animal manure, as artificial fertiliser, and in the form of a leguminous crop such as clover. In the latter case the clover must not be harvested but ploughed into the land. The roots of the clover below the ground contain about as much nitrogen as the crop has taken from the ground. The tops of the clover contain about twice as much nitrogen as the roots, and all of it has been won from the atmosphere [19]. Hence the ploughing in of the clover benefits the soil both by increasing its nitrogenous content and by improving its physical texture. It would be beyond our scope to discuss further methods of improving soils here, but it may be mentioned that in experiments carried out in Franklin county in 1928, it was shown that on land on which without treatment corn failed, treatment with manure, lime, and phosphates resulted in a corn crop of 50 bushels per acre [20].

Two typical counties in the Grand Prairie region of Illinois are McLean and Livingston. Of the surface of McLean some 88 per cent. is upland prairie soil, 9 per cent. is upland timber soil, and 3 per cent. is bottomland [21]. In Livingston, 94 per cent. is upland prairie soil, 2 per cent. timber soil, and the balance terrace and bottomland [22]. Both these counties thus consist almost wholly of highly tilled upland prairie soil probably unexcelled for fertility.

In Livingston the average holding is 171 acres, and the average value of the land $312. McLean county, with its corn, oats, wheat, timothy, and alfalfa stood first in the U.S.A. for crop values in 1919, apart from the irrigated country of Cali-

fornia and the tobacco county of Lancaster in Pennsylvania. McLean county's wealth is an interesting commentary on the vision of one man, Alby Smith, who as far back as 1836 foresaw the grass prairies of Illinois settled and cultivated.

The upland prairie soil, which is so magnificently fertile, forms appalling roads, and rock for road metal is conspicuous by its absence. To-day there are many splendid concrete roads, but once off these the dirt road, as it is called, becomes in wet weather an impassable sea of sticky mud. A common sight in the Corn Belt is to see motor-cars on a fine concrete highway wearing chains on the back wheels. They have come from a side road. Should a car be caught on a dirt road in one of the frequent thunderstorms of the Belt without this precaution, it stays there until such time as the road dries up, which may be a matter not of hours, but of days. The character of the surface of the dirt roads is well emphasised in the successful election slogan of a Corn Belt governor, who made excellent concrete roads in his area in place of the dirt ones. It was: "He took us out of the mud." As elements of the cultural landscape of transport the Corn Belt roads are remarkable for their long, straight stretches with right-angled turns. They were constructed along the old section lines dividing up the land and therefore conform to the regular grid pattern so common here and in Canada in the prairie regions. (See also Chapter 7.)

To complete our view of the major Corn Belt sub-regions as exemplified in Illinois, there remain the swamp and bottom-lands and the river terraces. They may form as little as 3 or 4 per cent. of a typical upland prairie county such as McLean, but may run to as much as 15 per cent. of a county like Tazewell, abutting on the Illinois river north and south of Pekin [23]. This bottomland grades from areas of pure swamp, useless for cultivation, to drained first bottom, which is probably as rich, if not richer, than the best agricultural land to be found elsewhere.

A typical section across such a piece of country shows the wide flat valley cut by the streams in the boulder clay covering

of the prairies (Fig. 35). These valleys were frequently partly refilled by glacial deposits (fine or coarse gravel and sand) carried by streams draining from the ice. In these fills terraces were cut by the post-glacial streams. The lowest level to-day is generally below stream-level, and is protected from flooding by natural or artificial levees. Such land, enriched by alluvial deposits, is known as first bottom. Cultivated terrace land is called second bottom, and may vary greatly in fertility. From it the trees, as we have seen, spread up on to the prairie edges.

In the heart of the Corn Belt between the Mississippi and the Illinois Rivers, the Spoon River valley illustrates the type of bottomland which is not of the highest grade (Fig. 36). The ground is badly drained. The lower land near the river is covered with weed, chiefly ragweed, and the higher parts of the valley floor has poor stunted corn. Such a condition is, however, exceptional.

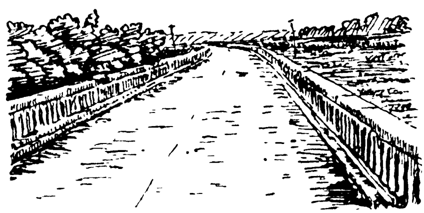


FIG. 36.—VIEW IN SPOON RIVER VALLEY, ILLINOIS.

Very typical of better conditions is the Illinois valley itself at Pekin (Fig. 35). Here the valley is some 3 to 4 miles in width [24], with bluffs at each side rising some 150 to 200 feet above the valley floor. Between the river and the eastern bluff lie two terraces some 20 and 80 feet respectively above water-level. On these terraces sprawls the city of Pekin—a typical river town of the prairie country protected on its terrace against floods, possessing deep water at the edge of the terrace, and conveniently located at points of easy access to eastward. Such towns prior to the railway era were the main community centres of the Belt and formed striking features of the cultural landscape of human settlement in relation to a clearly marked environment. Between the river and the foot of the western bluff lies first bottom below river-level. It is shut off by a natural levee artificially strengthened. In this river valley and the related prairie edges one can study all

the main subdivisions of the Belt—the upland prairies soils to south-east, the upland timber soils as one approaches the bluffs, the terrace soils of coarse gravel on which Pekin is built, and lastly the fertile bottomland. Where unprotected, as is here the case to the north, it may be useless swamp.

Crossing the river by the road bridge at Pekin, one can look back to the well-marked terrace on which the city stands, and can note that the outstanding units of the cultural landscape are, significantly, the great corn elevators from which the river boats loaded. Along the river on the near side one sees the raft-like floating homes of some of the few poor people in the Belt. They are known as river rats, and live by digging clams from the mud. South-west one looks along the levee, with, to right, corn stretching diagonally about three miles to the foot of the western bluff. Directly to westward one sees the tall corn in the first bottom flanked by a drainage canal from which the surplus water is pumped. In the immediate foreground is a hut containing a pump electrically driven (Plate 16). In this fashion surplus water is returned to the Illinois. If we climb down into the bottom we get a better idea of the height and luxuriance of the corn, rising some 8 to 10 feet, and we can appreciate the statement commonly made that in this

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FIG. 37.—CORN IN BOTTOMLAND, PEKIN.
Note height.

bottomland, growing on river alluvium year after year without rotation, we have the finest corn in the world (Fig. 37).

We have said little about climatic factors in detail. Corn is the crop of the humid mid-continental type of climate. Such a climate is not the most comfortable for human beings. In Chicago at night when one can with comfort wear a complete pyjama suit, one knows that the corn is standing still, something it cannot afford to do in its three months' race to reach 8 or 9 feet. Such nights are few and far between, however, and when conditions force one to shed the coat of the pyjama, the corn is growing moderately well. With day temperatures at 93 and relative humidity at 85, both sleep and pyjama suits become well-nigh impossible, but one can comfort oneself with the reflection that the corn is growing almost visibly by day and night, and the purchasing power of the prairie will be correspondingly great.

Speaking very generally, we may say that temperature limits the Belt to the north, rainfall to the west, and soil factors to the south. Corn, like cotton, cannot stand much frost, but its shorter growing period of between 130 and 140 days makes it possible to grow it to north of the Cotton Belt. For satisfactory germination it requires a ground temperature of about 55° F. To north of the zone in which it normally reaches maturity it can be satisfactorily grown as a forage crop, and this is true of the hay and dairying area, which stretches to east and west along the north edge of the Belt. With its large bulk it requires more water than a small grain crop like wheat. It is seldom grown with less than 20 inches of rain or its equivalent. The critical rainfall period in the Belt is the month of July. A 4-in. rainfall in this month gives about an average crop, other conditions being equal. A slight excess or deficiency causes a marked variation in the yield [25].

The chief insect pest the corn farmer has to deal with is the European corn borer [26], which, at first only found in the eastern part of the Belt, has now entered Illinois. Its control largely depends on the effective destruction of the corn stalks

and cobs, and it is thus intimately related to the harvesting problem. Where the refuse is fed to hogs or the practice of "hogging down corn" is the method of harvesting, then it gives little trouble, for it is destroyed in the process.

Within the Belt the prosperity of the individual farmer depends largely on soil factors, the July rainfall, and location with reference to market. Or to put it in another way, the quality and quantity of the crop depends largely on soil factors modified by climate, while the value of the crop depends mainly on the same factors modified by location with reference to the consuming centres.

Summarising, it may perhaps justly be stated that the geography of the typical Corn Belt community may be considered in one view to be the coincidence or relationship of two sets of facts, those depicting the human activity complex on the one hand, and those depicting the natural environmental complex on the other. The human activity complex is a specialised type of farming, with its related operations, in which corn production for sale as grain or "on the hoof," as the phrase is, is the dominant feature, with small grains, hay, clover, and some dairying, as lesser but essential features. The natural environmental complex is the wide, flat, slightly dissected prairie country of middle western America, with its deep, rich, upland prairie soils, its less rich upland timber soils, its steep-sided major river valleys, with their alluvial bottomland growing the finest corn in the world, and its humid mid-continental type of climate providing the heat, moisture, and freedom from frosts during the growing season, demanded by the sub-tropical crop which is the keystone of the whole system.

The concrete expression of this relationship is the cultural landscape of the Corn Belt, the farm buildings, the farms, the windmills and gasoline motor pumps, the fences, the growing corn and wheat and other grains, the hay, clover, and alfalfa, the cattle and hogs, the farm horses and tractors, the wagons, the Ford, the dirt roads and the concrete highways, the railways and elevators—in a phrase, the natural landscape of the

prairies as modified by man in his efforts to satisfy the demand for food products and community centres.

We have here a somewhat different America from that commonly depicted. It is this widespreading corn land of the Middle West which is the true heartland of America. Here we have an independent, prosperous body of farmers, farming what is probably the finest land in the world under climatic conditions which, with any sort of decent activity, make heavy yields inevitable. This body of men is increasingly sending its sons and daughters to college, and in this and in other ways is availing itself of all that is best in scientific methods of agriculture to improve the cultural landscape. Material welfare and ethical standards are on such a generally high level that in many parts locks and bolts are seldom used. Incredible as it may seem to some, men can leave their houses for weeks at a time without bar or bolt.

In the effort to satisfy his desire for food and subsistence in the prairies, man has adapted nature. This effort, as we have seen, is vividly expressed in the cultural landscape of the region. It formed the core of the problem and that to which we first directed our attention in the effort to elucidate the relationship between human activities and that combination of favourable climatic, topographic, and soil conditions which we may describe as the environmental complex of the Corn Belt.

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Chapter 9

THE CULTURAL LANDSCAPE OF THE HELIDON VILLAGE COMMUNITY

The cultural landscape considered as an expression of a village community's adaptation of its environment. A detailed study of grassland and tillage in the Helidon area of Northamptonshire.

It is becoming a geographical commonplace to say that man adapts nature to serve his ends. This adaptation expresses itself concretely in the facts of the cultural landscape. Of these, among the most prominent are houses, barns, and factories, in other words the shelters in which the adverse conditions of the natural environment force man to live, store his possessions, and in some cases to work. Where men gather together for mutual convenience or protection these forms of the cultural landscape become the village, town, or city. In the area[1] we consider in this chapter, about forty houses cluster together in a straggly sort of way to form the village of Helidon (Fig. 38).

The village nestles into a hollow on the north face of a little ironstone plateau, in the extreme eastern end of Northamptonshire, not far from the centre of England. The plateau forms a waterparting from which streams flow east to the North Sea, south to the Thames, and north and west to the Bristol Channel. The drainage of the village goes by way of the Leam into the Avon, and thence by way of the Severn to the western ocean. A little over half a mile south of the village, the Cherwell rises in a cellar on Cherwell Farm, and

[1] This area was selected partly because the writer knows nearly everyone in it, has spent a great deal of time in it, and has had exceptional opportunities, for which he is very grateful, for obtaining first-hand information from the farmers and others in the district, information which was freely and fully put at his disposal.

drains south to the Thames. A couple of miles to east of the village, headstreams of the Nene start on their long journey across eastern England to the Fens and the Wash.

It is perhaps fitting and significant of our English rural

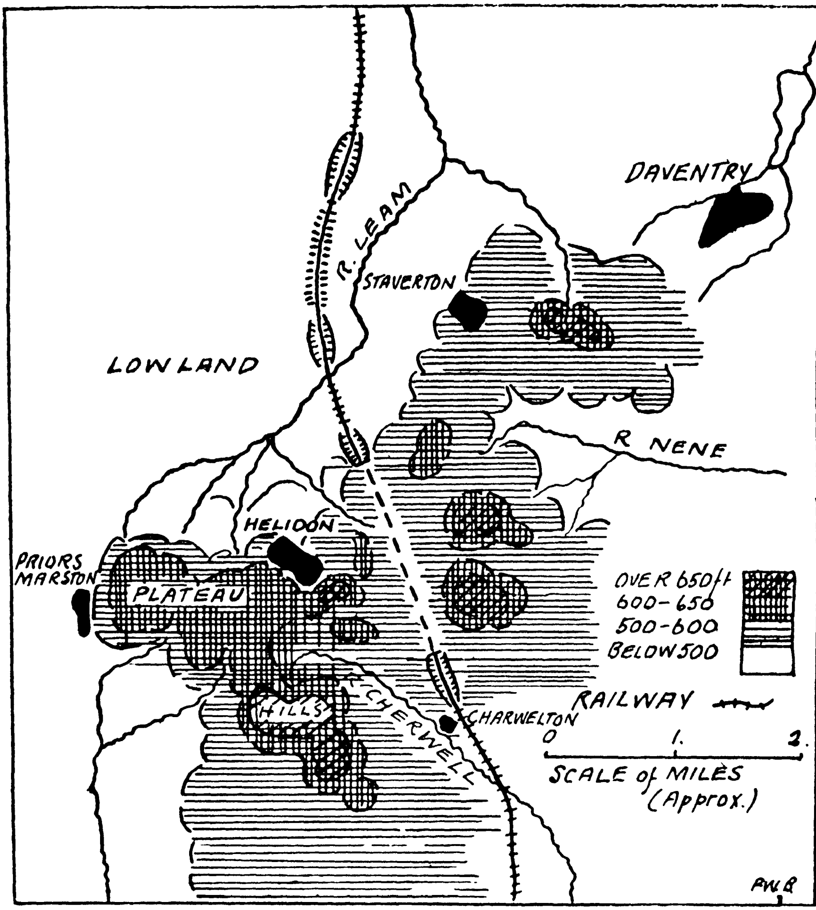

FIG. 38.—RELIEF MAP, HELIDON DISTRICT.

activities that here, near the very heart of the country, is an area of less than two square miles which provides a miniature epitome of the two main types of English farming—the grass farming of the clay lands of western and central England, and the arable or grain and root farming of the lighter and less rainy lands of the east. Threaded into the warp and woof of

the agricultural background, the iron ore mining of the district, though small, exemplifies one of the basic features of the manufacturing activity of England, which for the time being at least, tends to overshadow her agricultural interests.

The actual area shown on the map of land utilisation (Fig. 39) has somewhat arbitrary boundaries. It covers rather

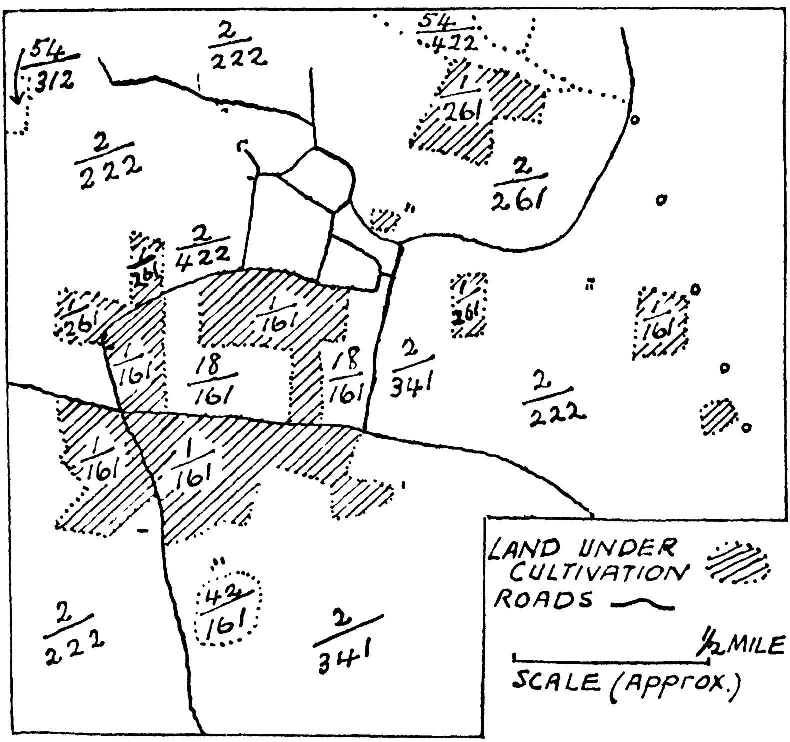

FIG. 39.—LAND UTILISATION MAP, HELIDON AREA.

Note.—Many fractions and parts of fractions omitted owing to difficulties of scale of reproduction.

more than the area of Helidon parish. The latter was found to give somewhat unsatisfactory boundaries for a study of this sort, since some of those living in the village go to work outside the parish, while some farmers living outside the parish have holdings in the parish, and draw labour from the village. The boundaries shown on the map roughly indicate the land which is more or less related to the village, and therefore indicate

an area within which the people look upon the village of Helidon rather than upon any one of the neighbouring villages of Priors Marston, Staverton, or Charwelton, as their natural focal point.

Within this area, in addition to the village, lies a large part of some four farms of about 300 to 400 acres, the whole of some three farms of between 100 and 200 acres, and about six small holdings of some 10 to 40 acres each. The rest of the area is occupied by a fox covert, a spinney, the iron workings and branch railroad track to them, the public roads, the railroad land over a tunnel, and the land on which the four large

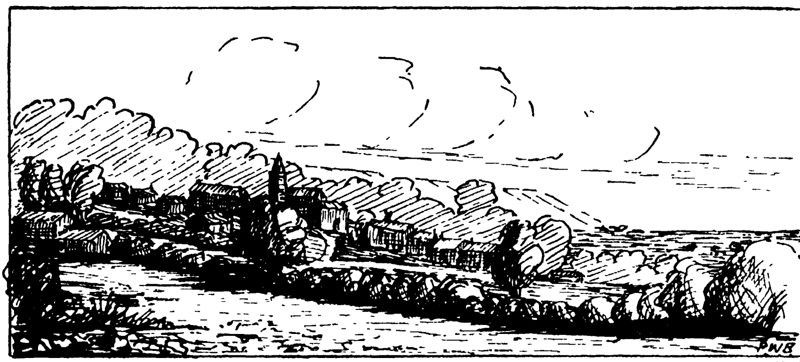

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FIG. 40.—VIEW OF VILLAGE, HELIDON.

houses in the district stand. These latter are all adjacent to the village. One of these is the vicarage, two are houses rented by people from outside as hunting boxes during the season, and the fourth is Helidon Grange, now occupied by people who, like the hunting people, draw their income from outside the area, but who, unlike them, live in the district permanently. Their chief relationships to the area are that they occupy land, give a certain amount of employment locally, and help largely in the social life of the village. The vicar has a very definite relationship to the area in deriving an income from the glebe farm of about 60 acres, and in caring for the spiritual needs and social life of the people.

The village itself (Fig. 40) forms the most striking unit of the cultural landscape. Of the total parish population of

some 170 people, about 120 live actually in the village. The men either have holdings in the surrounding area, or work for wages at some of the neighbouring activities. Six of the villagers are smallholders owning two or three fields. These smallholders work the land which they rent, own usually a cart and horse, help the larger farmers at harvest time, who in turn help them with harvesting machinery. Five of the villagers are agricultural labourers working on the land for wages. Five others work at iron quarrying about one mile from the village. Two are jobbing gardeners, while a third is gardener at the Grange. Two other men work on the railway. One man acts as chauffeur to one of the hunting lodges during the season and drives a car for the village at other times. One of the village women acts as an extra help in the Grange, which has its own staff of servants living in, as also have the hunting lodges and the vicarage. One house in the village is occupied by people from outside as a holiday cottage. There is a small co-operative store, another small store with sundries, a post office which also sells sweets, two public houses, one at each end of the village, a church, and last but by no means least, the village school and school-house, the former serving also as the village assembly hall for meetings and social activities. The school mistress and her assistant have charge of some twenty-five children. The bulk of the supplies which are not produced locally come from the neighbouring town of Daventry, some five miles away—the baker and postman coming daily, the butcher twice a week.

The village is just large enough to support a cricket team which can draw on most of the men, but not large enough to run a football team, which would have to be made up of youngish men only. There is no shoemaker and no policeman.

It is clear from the above brief survey that the village is chiefly a dormitory housing the smallholders, the agricultural labourers, the ironworkers, and some old people and children, and a community centre providing certain services such as those rendered by school, post office, and small stores. The

public houses and the school-house are social centres, and the church provides spiritual help.

Many of the houses show their relationship to the environment in being built of the local marlstone or ironstone, others more recent are built of brick, and additions and repairs to old ones, it is interesting to note, are made in brick, it being a more convenient and cheaper, and more easily handled material, made available by the improvement in modern transportation methods.

The village forms an interesting community, sufficiently small for every member to know and be thoroughly informed as to the nature of the activities of everyone else. It is sufficiently representative of different types of activity to give a fairly typical cross-section of rural activity. In fact, in miniature, and in a rudimentary sort of way, one has here attained one of the chief objects of the Rotary Club movement in the cities—the bringing into contact with one another in a social way representatives of the varied activities of the community.

Having seen, then, something of the composition and activities of the village community, let us consider these activities and those of the neighbouring farmers, in greater detail and in relation to the natural environment. The farms fall broadly into one of two classes, farms which are wholly or almost wholly grass farms, the latter having perhaps one or two small fields under the plough, and farms which are about 30 or 40 per cent. arable, or less, and the remainder under grass.

We can best examine these different activities by visiting what we may call an ideal farm working under each of these conditions. Although all the information asked for was freely given by the farmers and others in the district, it was given on the understanding that the actual details referring to individual farms would not be published. Although individual farms were carefully studied, any word picture given here is a composite picture built up to show the average conditions in a typical farm, and based on the information obtained from a number of farms. In addition to information personally

obtained, two questionnaires were circulated and filled up. One of these is given in outline in Chapter 4, the other was only circulated to selected farmers to amplify the information on certain points given in the first questionnaire.

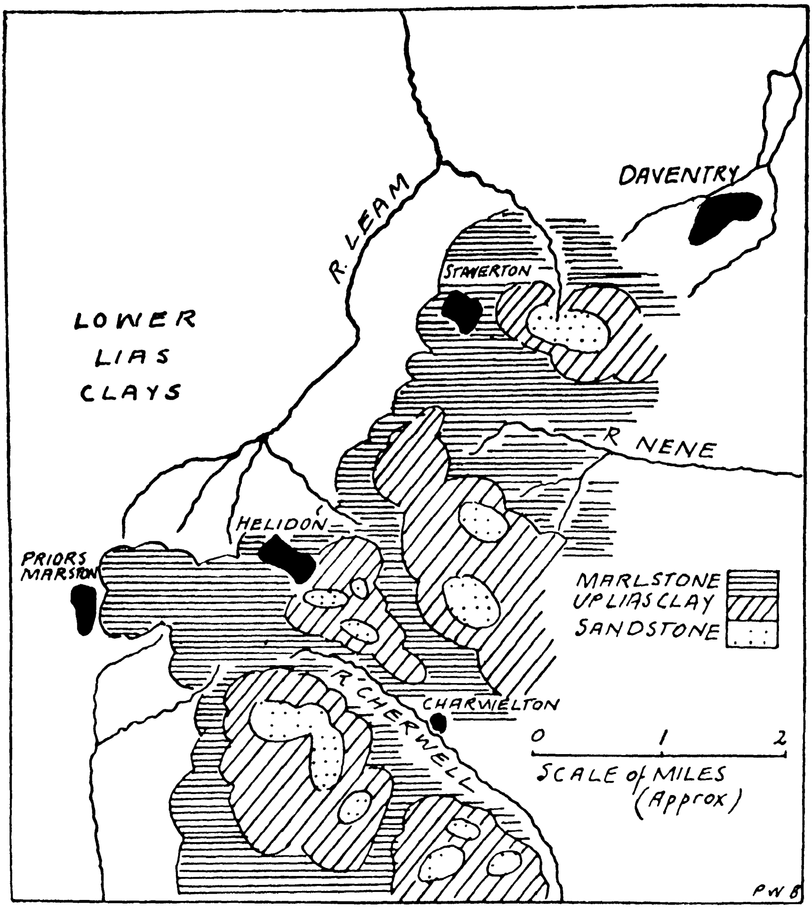

FIG. 41.—STRUCTURE MAP, HELIDON AREA.

Leaving the village to south, we climb on to a plateau. A glance at the map (Fig. 38) shows this plateau as the main topographical unit. It runs east and west in the centre of the region. It is about one mile long by three-quarters in breadth. Its general elevation is a little over 600 feet. Its surface is very level but not quite horizontal, for it is tilted

slightly to the south-east, where it is bounded by a line of hills which rise sharply 50 to 100 feet above the surface of the plateau. These, after a gap occupied by the Cherwell, rise also to east. The plateau itself drops quite steeply to the north and east into the valley of the Leam meandering across a flat lowland from 200 to 300 feet below the brink of the plateau. This lowland and the north slope of the plateau are composed of the lower lias clays ; the plateau is composed of ironstone or marlstone. On top of it to east and south are the patches of hills which are capped with the Northampton sandstone, but their major bulk consists of the upper lias clays. The structural and topographical features of the area

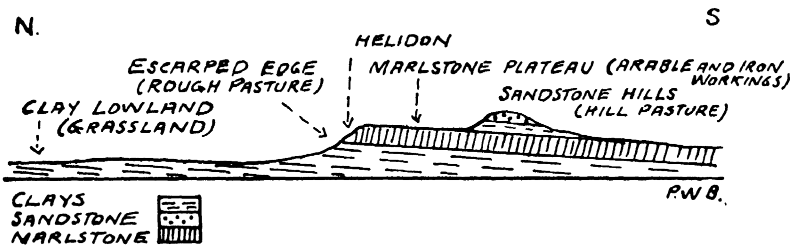

FIG. 42.—PROFILE, HELIDON AREA.

are thus very simple, but present some striking contrasts. They are clay lowland, steep edge, marlstone plateau, and rising on it the sand-capped hills (Figs. 41, 42).

The typical plateau farm is about 150 acres. Of this about 50 acres, or one-third, is under the plough. This ploughland is wholly on the plateau. The grassland is partly on the plateau and partly on the edge and lowland beyond. The farmhouse is small. Nearby are the barns and outhouses. A tractor stands in the yard. Close by in the outhouses are various pieces of farm machinery. The farmer, an intelligent-looking man, is busy at the tractor. Three other men are engaged at various jobs preliminary to work in the fields.

Passing out into the arable fields we note that rather more than one-fifth of the land is under rotation grass, about one-fifth under oats, one tenth under wheat. The balance is under barley, potatoes, roots, and other crops. Cake and

other feeding-stuffs and home cereals are ground to supplement the roots for winter feed. The general rotation is wheat or oats, roots, barley or oats, and clover. Farmyard manure is used for the cereals and fertiliser is bought for the potatoes.

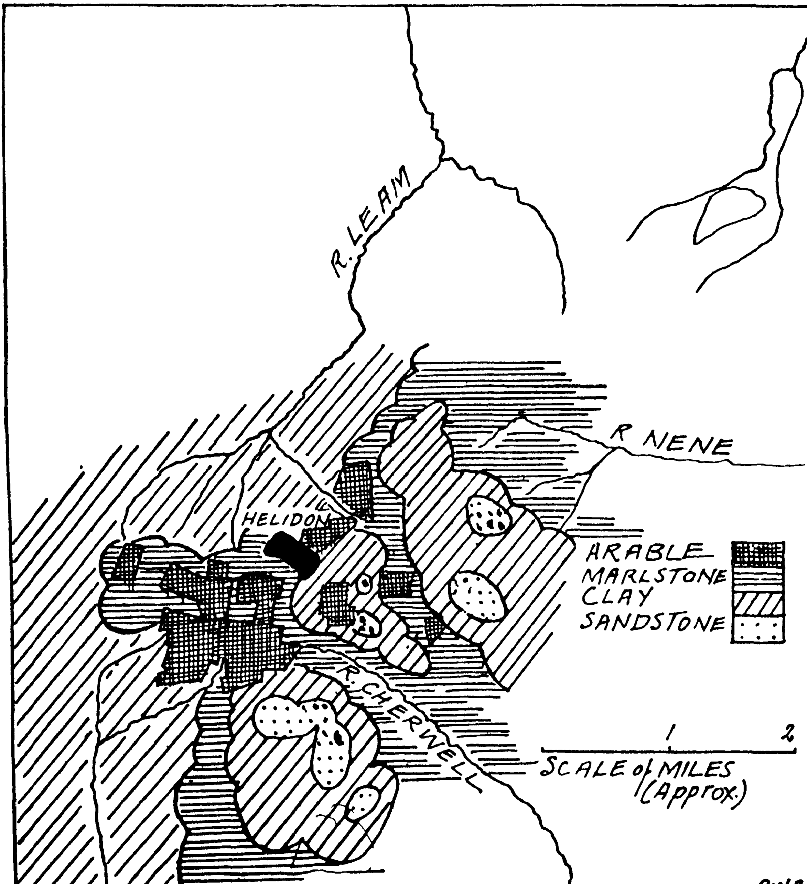

FIG. 43.—ARABLE IN RELATION TO STRUCTURAL, HELIDON AREA.

The main water supply of the farm comes from a well on the plateau, but on the lowland, spring water is available for stock. Of the livestock two hundred are sheep, and thirty are cattle of which about one-third are dairy cattle in milk. The average milk production is about 250 gallons per month.

The high percentage of arable on the plateau farms is chiefly due to the character of the soil. It is a light red friable loam—the decomposition of the marlstone rock. Sir John Russell in the new edition of *Soil Conditions and Plant Growth* points out the characteristics of a soil in good tilth. The soil particles should be of such a size as to stand reasonable wetting without breaking down into a slime or mud. If they are too small they tend to blow away and water drains too rapidly through them. If too large, they become large lumps unsuitable for cultivation and become waterlogged. Plant roots in such a soil do not work freely, and the excessive water is detrimental to their growth. The physical composition of the plateau soil in this district is made up of fine crumbs which make an admirable soil for cultivation. The drainage would tend to be excessive were it not for the relatively heavy rainfall of the plateau which faces the rain-bearing winds sweeping from the south-west across the Avon lowland. They are forced to rise and deposit their moisture by the plateau edge. As the water runs away rather rapidly, the plateau can do with rain every week—a condition generally experienced. Owing also to this rapid drainage, it is possible to work the land two days after heavy rain. The drainage by evaporation is not excessive, as the fine soil particles conserve the water just as the fine soil particles produced by hoeing a garden tend to conserve the moisture. It is also very satisfactory soil for tractor work. On the typical farm all the work is done by tractor. The wheat is grown on the heavier parts of the land. On the lighter patches its heavy head tends to make it lie down, since its root-grip is insufficient. The average yield of wheat is about four quarters, oats about six quarters, barley about four and a half quarters, and swedes about ten tons to the acre. During the War all the plateau was under the plough. To-day it just pays to cultivate it owing to the exceptionally favourable physical setting, in which the soil, coupled with the extra rainfall balancing some of the deficiencies of the soil, plays the chief part.

On one of the sand-capped hills facing the westerly wind,

is the ruin of an old windmill. It is one of several others on this stretch of upland overlooking the Avon. Once these mills ground the local corn. They were turned on turntables to face the wind. Later, with the competition both from flour milling at the ports with the development of the American import, and from a local steam mill at Byfield nearby, coupled with the slackness of the owner of the mill, it fell

[P. W. B. *Based partly on pencil sketch by Miss V. Hewitt.*

FIG. 44.—VIEW ON PLATEAU, HELIDON.

into disuse. Some grain from this district still goes to a watermill beyond Daventry. The bulk of the farm produce to-day is sold at the neighbouring centres of Daventry, Rugby, and Leamington.

At the south side of the plateau, near the foot of the sand-capped ridge, are the iron workings. The ore lies about 4 to 6 feet below the surface. The slight surface covering is easily stripped away. Beginning near the road on the

south side of the plateau, the ground lies about 4 feet below road-level. It is now cultivated, but from it the ore bed has been removed and the surface cover replaced. The workings to-day are about half a mile south of the road. By this method of working the value of the land for agricultural purposes is maintained. A short branch line of railway runs down to the main line through the fields in a south-easterly direction to Charwelton, from which about 1,100 tons of ore per week are shipped to the north. It is interesting to note as an example of an attitude frequently found elsewhere, that when the line was first built there were numerous protests on the ground that where it ran close to the road it frightened horses. These workings, though on a small scale, are similar in type to those found in the Jurassic belt of marlstone and Northampton sandstone rocks which cross England diagonally from the Bristol Channel to the Humber, and the percentage of metal in the ore, some 20 per cent., is about the same. These workings add variety to the activities of the district, and have interesting social reactions in bringing, into an otherwise purely agricultural region, an industrial viewpoint.

Throughout the district, but particularly in connection with the sand-capped hills to south and east, there are a great number of rabbits. These form an important minor source of food supply. The hills are in the main used for sheep. The short herbage and the drier conditions are admirably suited to their requirements, hence the relatively large number of sheep on the typical plateau farm.

Leaving the plateau and its activities, we come down to the grassland. The typical farm here, of the dairy and beef type, is about 300 acres, of which not more than one-eighth is under cultivation. The farmhouse is of medium size with many barns for livestock. Milk cans are a prominent feature in the yard. Machines for chaff-cutting, pulping, and grinding food for the livestock, and hay elevators, are very much in evidence. There are about four hundred head of livestock, of which more than half are sheep. Of the cattle about half are dairy cattle and the monthly milk yield is about 1,000 gallons.

The farmhouse is partly built of local stone from the marlstone layer, and numerous fossils in the stone are visible evidence of its source. Repairs and certain additions have been carried out in brick.

Around the farm the landscape is that typical of the English Midlands. It is a rolling grass country with hedges separating the fields in which are mostly cattle and sheep, the sheep tending to be on the higher land and the cattle on both higher fields and the low fields near the river bottoms. Many of the fields of the higher parts have regular undulations running across them, the evidence of old drainage for cultivation. These lowland sheep are heavier than those in the hills above. The square tower of the stone-built church shows up in its clump of trees beyond on the plateau slope dominating the village. Several haystacks are visible near the farm buildings, the hay being stacked and cut for the winter feeding of the cattle.

We are here looking at what is the most typical English rural activity, mixed farming, in which cattle predominate for milk and meat production, coupled with sheep farming mainly for lamb production and a little wool, the whole supplemented by a little cultivation mainly to supply winter feed for the livestock in the form of straw and roots, and partly for vegetables, etc., for the farmer's table. It is the main activity of the grassland on the heavy clay loams of much of central England in the lowlands and along the river valleys, where the rainfall is over 30 inches per annum. Nearly two-thirds (64 per cent.) of the value of English agricultural products is derived from grassland [2, 8]. More and more in England tillage is being replaced by seeding down the land to grass. Apart from milk, of which, from its very nature, the bulk must be home-produced, beef, mutton, and pig-meat are the only major food products for which the British farmer can still command roughly half the home market [2, 3]. Even in such a product of the grassland as butter, the home farmer only produces about one-tenth of the total consumption in Great Britain, although he still produces about one-fifth of the wheat consumed.

The grassland is a perennial resource which does not become worked out, as does a mine, or exhausted, as does land under cultivation unless suitable fertilisers are provided. The droppings of the livestock are sufficient to maintain its fertility. It is mostly too wet to produce cereals in competition with the produce of more favoured areas. Some of it would never grow cereals because of its heavy, waterlogged character. While it does not become exhausted, men are turning more and more every day to methods of increasing its yield. These vary from simple harrowing to the application of various fertilisers [4] such as basic slag [5, 6, 7] and the selection and development of special grasses such as white clover and perennial rye grass. It has been demonstrated that it is perfectly practicable to increase grassland yields as much as 50 per cent. by the application of suitable dressings of fertiliser coupled with improved strains of grass [8]. It has also been shown in Kenya that the addition of phosphates to soils greatly increases the value of the pastures thus treated from the grazing point of view [9, 10]. Where growth is stimulated by application of fertilisers, the longer period during which grass is available is of great value to the farmer in reducing the amount of winter feed needed. All grassland needs rest during the winter period. Hence, in the Midlands the practice is to buy cattle in the spring and sell them off in autumn, either to the butcher or to such regions as Norfolk for winter fattening and finishing.

Grasslands have been roughly divided into three classes [1]. In the first class are those lands which are sufficiently rich to carry one bullock or six sheep per 1½ acres and to feed them sufficiently so that cake is not needed for finishing purposes. In the second class come those lands on which the same number of head per unit of area require cake or corn for finishing. In the last class are the poorer or rougher lands which are only suitable for breeding purposes or young cattle. The area we are studying falls midway between classes one and two, some land falling into the first class and some into the second. Owing partly to its elevation and partly to its aspect in relation

to the rain-bearing winds and the plateau, the grassland of this district does not suffer so much in dry seasons as that of other parts of the Midlands. Thus in the exceptionally dry spring and early summer of 1929, the grass was not quite so slow in starting into growth here, nor did the livestock suffer so much from shortage of water as was the case in other districts.

For best results the grassland of this and other areas needs to be properly stocked. If there are too few livestock the pastures grow too fast and tend to become rank, and because of the understocking the most economical use is not being made of the land. Where pastures are overstocked they are eaten too close, especially by sheep, with bad results on subsequent grass crops. Where grass is kept steadily cropped but not overcropped, then, as in the case of a lawn cut regularly by a lawn-mower, the grass is kept in the best condition for rapid growth and forms the thick sole to the pasture which produces young and succulent feed for the livestock. Such grass in vigorous growth has a feeding value practically equal to that of linseed cake, and is the ideal feeding-stuff for dairy cattle. This problem of pasture management is one of considerable importance and complexity, as, while it is easy to know how many head of livestock a pasture should carry, it is not easy to get stock or to sell stock at the right price to ensure that this is done. We see here in this problem of grassland management a very close and delicate relationship between man and his environment, if that environment is to be used to the greatest effect in satisfying the demands it is best suited to satisfy. That it is very profitable when successfully done is seen in a series of accounts kept recently in Wiltshire, as a result of which it was shown that while the yield in produce for every £1 spent on labour on arable land was £3, the yield for every £1 so spent on grassland was £4 [11]. For this and other reasons the grassland, although yielding products of high value, does not support so many people as the tilled country per unit of area. The Helidon district is typical of this fact and the smaller scattered houses of much of the grassland, although on a house map appearing to contain more people

than that of the tilled area, [illegible] not contain so large a population.

The farm we are considering is a mixed beef and milk farm. The only dairy product produced for sale is milk. Butter and cheese are found not to pay in competition with other areas. The marketing of the milk on a large scale is still a problem which awaits satisfactory solution. Some of the milk is marketed locally by smallholders, but the great bulk goes out of the district, and probably most of it finds its way to London. The bulk of the milk is collected each morning by motor lorries and goes by road to the dairies at Dunchurch. Some of it goes by motor lorry to Banbury and some to Charwelton Station. It is sold by the individual farmers to the milk companies under three grades, A, B, and C. The selling of the milk by the individual farmer is not effectively organised, and something in the nature of a farmers' trading association or pool is considered to be necessary before the farmer can get a satisfactory return for his labour. One of the main difficulties here is that the maximum surplus of milk is available at a time when maximum surpluses are available from other districts, so that part of the milk then sold must be manufactured and comes into competition with cheaper milk products imported from abroad [12]. The farmer also complains that the grading of his milk is not satisfactory and that this is partly due to the irregularity of the milk companies' collections, so that milk may be left standing half the day in cans, perhaps in hot weather, deteriorating in quality [13, 14].

The motor-truck collection of milk is a comparatively modern growth which has had the effect of considerably widening the area from which it is profitable to collect it. Prior to this development the milk had to be hauled to the railway from a more restricted area, and in those days the farmer specialised rather in beef and other dairy products and more tillage. Under its influence, coupled with the increasing demand for the product in the large centres of population as population grows and people realise more fully the value of milk products as food, milk has become in this district

the most effective way of marketing the produce of the grassland.

The other chief type of farm in the district is a purely beef farm. Such a farm is similar in general type to the dairy-beef farms, but lacks many of the appliances and has no milk cans such as are to be seen around the dairy farms. The land is wholly under grass and its area is about 400 acres. There are a few sheep in the fields on the slopes of the plateau, but practically all the livestock are beef cattle. There are two cows milking, but the milk is not sold. Apart from what is needed on the farm, it is given to the pony or the cows. The farmer buys practically all his cattle as two-year-olds in the Welsh markets. He brings them here by rail and fattens them on the rich grass, or sells them to the eastern counties for final finishing.

Closely related to the grassland are the hunting activities of the district. We have seen that certain houses in the village are rented for this purpose. We are on the edge of some of the finest hunting country in England. Some of the best packs are not far off. To south are the Bicester and Grafton. To west the South Warwickshire. To north lies the Pytchley country, a country in which the Master of the Pytchley reigns supreme over the countryside. Here at Helidon, within reasonable distance, one has the choice of four packs. This makes hunting expensive in the district, for it involves four subscriptions. The local farmers at Helidon do not hunt much, as they are too busy in the winter with lambing and dairy work. The most typical hunting country is where beef cattle reign supreme. There, where cattle are bought in the spring and sold off in the autumn, the farmers' time is largely free during the winter for devotion to sport. It is no uncommon thing under such conditions for the farmer to attend three meets per week, so long as the winter remains sufficiently open for cross-country work. With severe frost hunting shuts down, as it then becomes too dangerous for men and horses. But owing to the relatively mild climate in central England, it is not usual for much time to be lost from hunting on this account. Hunting provides vigorous and

healthy exercise, an outlet for animal spirits, and a series of social functions such as hunt dinners and hunt balls, which are an essential feature of the social life of the English countryside. It has built up a rigid social etiquette, in which gainsaying the Master is nearly as great a social crime as shooting a fox. To see a burly rough-haired terrier first facing and then, on second thoughts, giving path to a fox reminds one that the protected fox is in his own way master of the countryside, including the hen runs, and fears only man and a pack of large hounds. Dotted about over the face of the countryside are the fox coverts, of which the corner of one shows on Fig. 39. They are to-day elements of the cultural landscape of hunting. They are in part natural cover preserved and in part artificially planted.

Forms of the cultural landscape to which we have not yet referred are the power lines carrying electrical energy into the area. In many parts of England, including this area, economic and social conditions are altering as a result of the increasing use of electrical current in rural districts. The power for this area comes across country from Northampton. Only recently introduced into the village, many of the farms and houses have now installed electric light and power. The power is used in one case for cooking, and in several for running small farm machines, thus economising labour. It is also used in the winter for lantern lectures under the University Extension movement, and in a recent winter the village ran a class in which over fifty students from the village and surrounding district took part.

Within the district we have been describing there are no main roads, as they pass to east and west. Up to recently the roads were mere country lanes, but within the last few years road development and improvement has entered the district. The lanes are now tar macadam finished, providing a very good non-slip surface. One railway passes through the north-east corner of the district to Charwelton station. The escarped edge of the plateau forces it to approach by means of cutting and then tunnel for three-quarters of a mile. The brick

air-shafts of the tunnel, especially when a train is passing through and the smoke pours out through the chimney-like tops of the air-shafts, form striking elements of the landscape which at first puzzle very much a stranger who is approaching from the north and is quite unaware of the existence of the tunnel. Along the top of the plateau, directly over the tunnel, is a long narrow ridge of material which at first sight has the appearance of some ancient earthwork. It is modern, however, as the railway, which only bought the land immediately over the tunnel, was compelled to dump on top all the material excavated.

The only other item of the cultural landscape of particular interest in the district, is a small hydro-electric plant which is situated on a stream draining the northern face of the plateau. It was set up before the coming of the power line, to light a country house just outside the area, and forms a miniature illustration of man's utilisation of nature's slope and energy to satisfy his need for power.

We have seen, then, something of the way in which the cultural landscape of a small area can be interpreted as the expression of the relationship between man and the physical setting in which he lives. The position of the village, the tillage farms, the dairy farms, and the beef farms are each related to soil, slope, elevation, drainage, and climatic conditions. The roads and railway are related chiefly to the relief; the iron workings to structure, the horizontal surface of the plateau, and the ease of communication; the water-power development to slope and stream. The focusing of the economic and social activities on the village is mainly a matter of distance, but partly also a matter of its position at the junction line of two or more types of activity. The road improvement is due to the interaction of motor transport and surface material, including gradient and climate.

It is easy in this area to recognise certain clear-cut geographic features in which certain forms of the cultural landscape tend to repeat themselves. The marlstone plateau with its tilled land and arable farms, its soils, and climatic conditions,

forms one such feature. The sand-capped hills with their sheep and rabbit shooting form another. The lowland grassland with its dairy and beef farms, its heavier soils, its drainage, and grass fields is a third. The marlstone edge with its mixed marl and clay soils, its partial cultivation, its sheep and cattle, is an easily recognisable fourth. But while we can recognise these we see that they are to a considerable extent interdependent, as the plateau farmers, although their major activities are elsewhere, have holdings on the hills, on the grassland, and on the edge of the plateau ; while some of the grassland farmers have holdings also on the slope, on the hills, and on bits of the plateau. The iron workings on the plateau are the most distinctive separate unit, but even they draw their labour in part from the village and their work is related to the farming on the plateau. The village itself is a composite expression of the supply, domestic, and social needs of the whole, so that the village is from many points of view the focal point of all these activities from the standpoint of man, who is the chief element of the cultural landscape, as the motivating force in and behind all the forms of the cultural landscape that we see.

Apart from manufacturing industry, trade, shipping, banking, transportation, and the production of coal, the chief types of English activity are related to the production of food and raw materials and are carried on in rural areas. In this district near the heart of England, on one of her major water-partings, we have epitomised the main characteristics of her rural activities. The tillage of the plateau, carried on under exceptionally favourable conditions for central England, stands for cultivation slowly retreating in face of competition from more favoured areas at home and abroad, and steadily giving way to the surrounding grassland with its beef, mutton, and milk, on which, with improved methods of handling, based on the researches of the Agricultural Colleges and Research Institutes, the future prosperity of much of the countryside would seem to depend. Into it we have threaded the iron workings, typifying one of the fundamentals of that machine

production which is the basic feature of the other chief aspect of English economic life. In the focusing of these varied activities in the life of the village community we get some hint of the diversified social and economic contacts made possible in a district like this. This diversification is due to the rapid changes in the physical setting which take place within very short distances in much of rural England, and constitutes one of the chief charms of the English countryside.

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Chapter 10

THE CULTURAL LANDSCAPE OF FRUIT-GROWING COMMUNITIES

The fruit-growing areas of Wisbech and Evesham. The fruit belt of Michigan. The Fresno district of South California. Some tropical fruit areas.

SHARPLY contrasting with the cultural landscapes produced by the tillage and grassland of the Helidon district and the Corn Belt, is that of fruit farming in its many different aspects. Supporting a larger number of people per square mile, requiring more intensive cultivation, and leading to a more varied appearance, it stands for a more intensive community development, a more intimate contact with natural conditions, and a greater amount of individual skill to obtain satisfactory economic results.

The striking contrasts which exist within such a community and the contrasts with other occupations, are, perhaps, best seen in a land like Great Britain, where rapid changes in the soil and topographical conditions take place in relatively short distances. In the middle of the Fenland lies Wisbech, a community which in recent times has attained high rank in English fruit growing. We can usefully begin our study of its cultural landscape by running eastward from such a centre as Leicester, and noting some of the changes to be found as we pass over the different geological outcrops and topographical features which lie between it and the heart of the Fenland.

Leaving Leicester by the Uppingham Road, after passing Thurnby we run through a wide-stretching, rolling grassland, cut up by hedges into pastures. Dotted about all over the countryside are many little farms. In the fields are cattle—mostly beef cattle, but some are dairy cattle. Small plat-

forms here and there by the tiny lanes leading up to farms, have empty milk cans on them, left there for refilling by the trucks which collect the milk. If we pass in early spring, we may be fortunate enough to see the Quorn, with its pack, its red-coated huntsmen, and its top-hatted followers with a sprinkling of local farmers, in full cry over grass and hedge and ditch, for in spite of its elevation we are in an eastward extension of the Leicestershire grassland, probably the finest hunting country in England. Here it is due to the clay capping on the marlstone rock beneath. We pass through many small, poor-looking villages, and the farms are none too prosperous looking. Some fifteen miles out we dip into the clay-floored Eye Brook valley and climb a hill—Wardley Hill (Fig. 45). It has a double incline, the first occurring where we cross the marlstone bed. The next, a steep long slope, brings us out on the Northampton sandstone plateau. At once we note the change in the forms of the cultural landscape. The fields are highly tilled (Fig. 46).

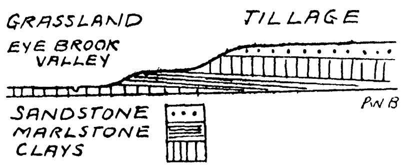

FIG. 45.—SKETCH PROFILE, WARDLEY HILL.

In a few minutes we enter Uppingham. Pleasantly located on the edge of the sandstone plateau, it is an important old-style market town, and the site of a great public school. Beyond the town, after a short run, we climb a limestone ridge and from it have a magnificent view of this new country we have entered. Broad, rolling, cultivated acres stretch on every hand. Prosperous farms with many outhouses, vigorous-looking working animals, trim, well-kept hedges, and narrow roads, for the land is valuable, take the place of the somewhat poor-looking cultural landscape we have passed through. From here to Peterborough at the edge of the fen, we see the same landscape, for we are in a region of richly diversified limestone, sand, and clay soils. Here and there are patches of timber and some heathlands on the heavier clays, or poorer sands, but they are conspicuous by reason of their relative absence.

The villages are large and prosperous looking, the farms are far apart, and most of the farm labourers live in the villages.

Beyond lies Peterborough, in many ways the focus both of the rich region of tillage we have just come through, and of the prosperous, but in appearance very different, western fenland we now enter.

Mile after mile the country stretches almost as flat as a billiard table to the far horizon. Twice we note slight rises and falls in the road, a matter of a few feet, as we enter and

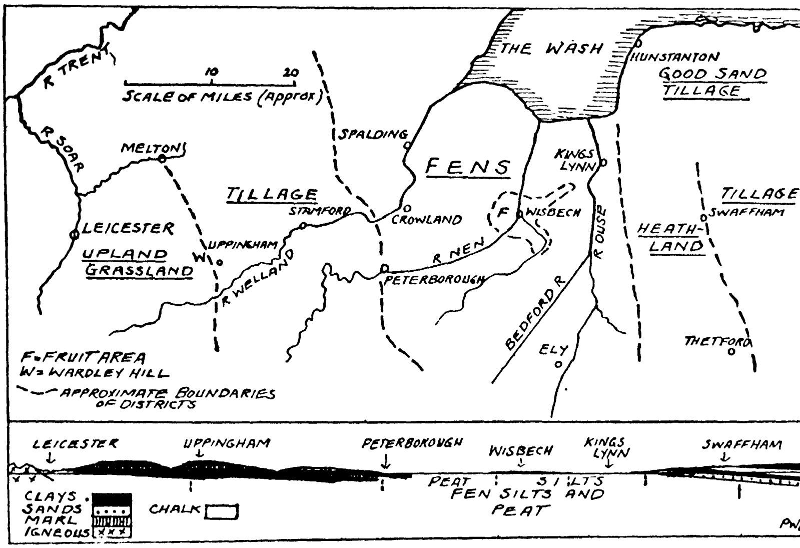

FIG. 46.—SKETCH-MAP, LEICESTER TO COAST.

leave the old fen islands of Eye and Thorney, situated on gravel patches which were just sufficient to lift them above the waters. The roads are straight for many a mile, with, on the side roads, curious switchback rises and falls due to settling. On either hand great deep drains carry off the surplus water. Beyond the drains we see cultivated fields—wide acres of grain, potatoes, and roots. The fields are commonly laid out in a definite rectangular pattern, the result of the drainage system and road development. Large farms with clumps of trees and many barns are set well apart. The countryside, in appearance resembles, if we exclude the drains, more closely

the American Corn Belt than any other district of England. The bulk of the Fenland consists of marine silts laid down when all this area was under water. There are also extensive stretches of peat lands developed from the marsh vegetation growing in the ancient fen. Drainage schemes, carried out during the seventeenth, eighteenth, and nineteenth centuries, have reclaimed almost all the fen, and have brought about the curious herring-bone layout of the water channels, and the consequent regularity of the fields. Occasional windmills used in these drainage schemes are prominent elements of the landscape, reminding one of Holland, though recently the drainage has been done by steam pumps, and the windmills either left derelict or converted to other uses.

We have now passed through three major districts of cultural landscape: that of the grasslands on the lias clays, that of the highly tilled region of Rutland on its mixed soils and irregular topography, and that of the intensive tillage of the fens—the last a striking example of man's adaptation of an unprepossessing natural environment. Approaching Wisbech we enter a fourth.

Imperceptibly, but for the change in the appearance of the cultural landscape, we have risen from elevations of 6 and 7 feet to those of 10, 15, and 20 feet above sea-level. The fields of grain and tubers give place to orchards, the houses of smallholders become more numerous, and after a run of about three miles we enter Wisbech.

Wisbech is the centre of the fruit district. It is a growing town, a collecting and shipment point for the fruit and market vegetables of its district, a canning centre, and a community centre. The head of navigation on the Nene, steamboats are still to be seen at its quays, bringing coal and other supplies and shipping produce out (Fig. 47).

Passing out of the town after crossing the river, we enter a district wholly devoted to fruit. By the roadside are many little stands selling magnificent strawberries, raspberries, and plums, in large chip baskets, at prices which, to the city dweller, seem absurd—an expression of the cost of marketing

and transport. Plum and apple orchards are the chief units of the landscape here. As apple trees take ten to fifteen years before they yield in quantity, they are spaced well apart in regular rows, with, in between, lines of small bush fruit—raspberries and gooseberries, and sometimes strawberries. The last mentioned are more commonly grown separately in large fields, for Wisbech is one of the great strawberry centres of England. In the fields are low sheds which house the implements, store the chip baskets for gathering the fruit, and the fertilisers needed for the intensive cultivation required. Pickers are busy on the bush fruit and strawberries. While we look a truck is loaded, bound for Wisbech. Later a lorry arrives for the pickers, who climb in, their day's work done. The bulk of the workers live in Wisbech, or the surrounding villages, going out each morning and returning each night. During harvest time many migratory workers come here from the cities to west, as local labour cannot then meet the demand. They are sometimes housed in sheds adjoining the orchards and sometimes live in the towns or villages nearby. This concentration of the workers in the villages leads to a much higher development of community life than is found in regions like the grasslands. It leads to a village *esprit de corps* which has valuable effects on work and character.

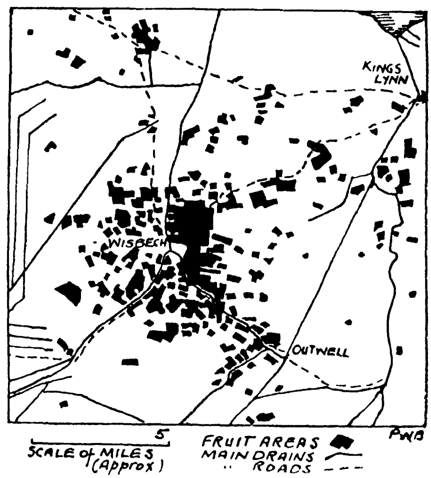

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FIG. 47.—SKETCH-MAP, ORCHARDS, WISBECH.

The cultural landscape of the Wisbech district is the expression of man's adaptation of his environment in a highly specialised fashion. Environmental factors affect his activity here in numerous ways. We have seen something of the

general layout on the island-like area surrounding Wisbech for two or three miles. Along the main road to north-east towards Lynn, and that to south-east towards Outwell, the slightly raised ground is also utilised for fruit to a distance of four or five miles. The soil is the relatively well-drained loose soil of the old marine silts improved by careful cultivation and drainage. Apple trees in other districts do best on slopes. They thus escape the concentration in the valley bottoms of the cold air drainage from the hills. Here, on this great reclaimed fenland with its miles of flat country far from high ground, the air drainage is negligible.[1] Weather conditions cause marked fluctuations in the yield. Too mild a spring may cause the buds to open unduly early and be caught by the late frosts, thus failing to set properly. Clear, sunny weather favours fertilisation, for in it the pollen is carried freely from flower to flower. Hail may cause serious damage to the young swelling fruit. Windy weather results in heavy windfalls, with bruised fruit which will not keep. Wet weather at harvest time interrupts picking. Many insect pests attack the trees. Passing through the Wisbech district in an early spring evening, the limewashed stems of the orchards look like a vast array of ghostly visitants from another planet and make us glad, if we are nervously inclined, to reach the shelter of the town. Careful cultivation and feeding results in heavier crops, and much skill is called for in handling insect pests, and neutralising, as far as possible, the vagaries of the weather. Over and above all this comes nature's time-element, for tree fruit is a long-term crop, and profitable operation requires that it should be supplemented by short-time catch crops, such as strawberries, to fill the gap due to waiting and the weather fluctuations.

Modern railway facilities, motor trucks, co-operation, and skilled handling and packing, provide the needed organisation

[1] In spite of this fact apples as a crop are not entirely satisfactory in the Wisbech area, their cultivation being mainly confined to the Bramley seedling which seems specially suited to the local conditions. The plum crop is more important than the apple crop in the Wisbech area.

for successful marketing. The flat, well-made fen roads, and other elements of the environmental complex, the large city demand in industrial England, coupled with scientific methods of horticulture, combine to produce here a fruit-growing community with few equals, and a density of population, related to that environment, which stands out clearly on the house maps of the district (Fig. 13).

By contrast with this district we just here briefly refer to that round Evesham. Running southwards from Stratford, along the vale of Avon, we rapidly come into patches of orchard country. These are mostly found on the slopes in the slightly irregular topography of the valley floor. We pass many smallholders' dwellings by the roadside. We are in a land where overlying the clay floor of the vale there are many patches of warm, sandy loam admirably suited for fruit and vegetables. Many fields of market-garden produce occupy the low ground between the orchards. The whole, by comparison with Wisbech, is irregular and patchy. The orchards are mostly plum and apple. In the season we see the same roadside stalls selling produce. In the low-lying fields on the rich grassland by the river are many cattle. Smallholders living on the countryside are more in evidence. The villages are very attractive and contrast sharply with those of the Fenland. They are partly composed of the old, interesting, half-timbered houses of Shakespeare's England, reminding us that here we are in a settled country in which lie many of the roots of English history. Its castles on defensive points by the river, its flourishing market towns, its ruins and great demesnes, have a half-medieval air, which contrasts vividly with the modern co-operative fruit and vegetable activities of the district.

This modern development is an expression of the combination of railway facilities, adjacent markets in central England, and the warm, light soils of the New Red formation. The main differences from the Wisbech area are rooted in the environmental complex.

Westward round Hereford and Worcester, south-westward

in Somerset and Devon, south-eastward in the Hampshire Basin, and in Kent, northward in the Blairgowrie district of Scotland, we would find cultural landscapes related to fruit growing, similar in certain broad general features to those we have been studying, but differing in detail in response, in the main, to varying physical settings and their adaptation by man. In all of them we find intensively cultivated fields and plots, numerous small dwellings and villages, indicating greater numbers of people supported on the land. In consequence we find a more intense community life, the higher average level of intelligence demanded under such conditions; also a utilisation of soils of a sandy or gravelly nature rather light for grain or pasture, and sometimes of slopes too steep for normal cultivation owing to the likelihood of soil wash when unprotected by a cover of trees or grass.

In the Lea valley, where about fifty per cent. of the English glasshouse industry is concentrated, we would find a still more striking cultural landscape, one which recently suffered severely from an exceptionally severe hailstorm through the destruction of many thousands of square feet of glass.

Let us turn to another specialised fruit zone which in some respects resembles and in others contrasts with these regions. In North America there are five specialised fruit districts which are outstanding in the northern part of the continent. They lie in New England, around the shores of Lake Erie, in the Annapolis valley of Nova Scotia, in the valleys of British Columbia, Washington, and Oregon, and along the east shore of Michigan. The last, a zone 200 miles long, backing the dune and marshland elsewhere described (Chapter 15), is one of the great fruit belts of the world (Fig. 48).

Leaving Chicago, we run eastward and then northward. At first the country is industrial; later it changes to open country with cattle and grain. As we turn north-east towards Michigan city, we begin to see orchards. Vineyards appear. We suddenly feel as if transported to France. The cultural landscape takes on a definite chess-board-like pattern, accentuated by the low-hung lines of vines, broken here and there

by the no less regular layout of the apple, pear, plum, and peach orchards, and small towns and villages, with isolated farms and sheds. Other elements of the landscape are the fine

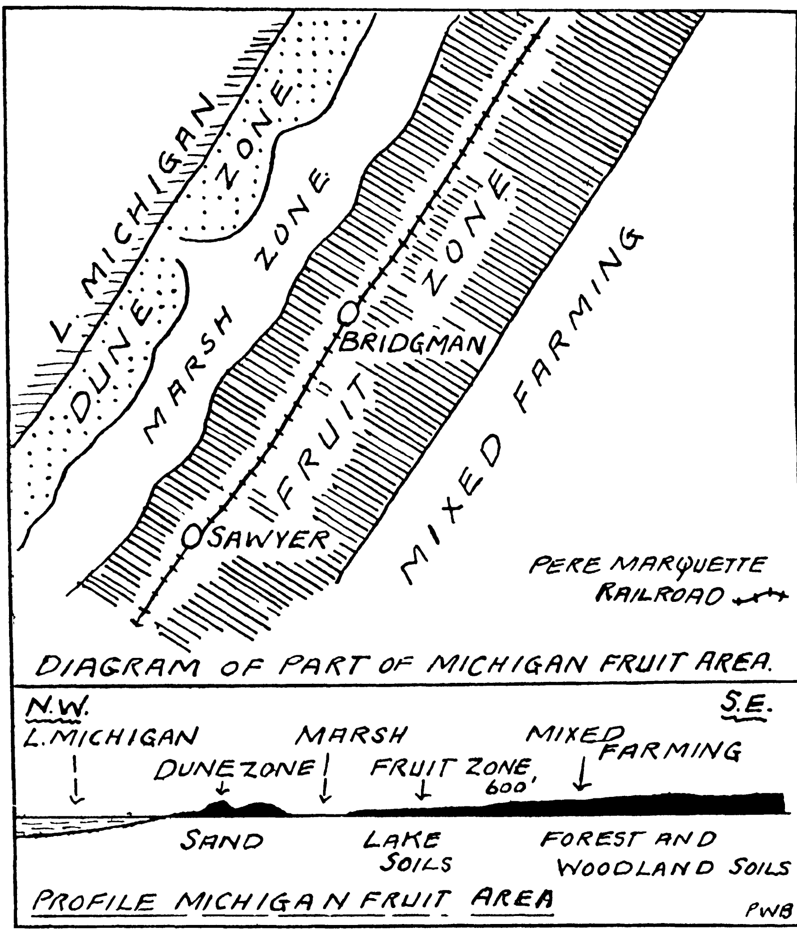

FIG 48.—SKETCH-MAP OF MICHIGAN FRUIT BELT

concrete highways, the gravel side roads, and the telephone and power distribution poles and wires.

The typical vineyard shows long straight lines of vines trained on wires attached at frequent intervals to stout wooden posts. The rows are well spaced apart. In between, the ground is well turned and ridged (Fig. 49). In a few moments

we see a two-horse cultivator, the product of Chicago's agricultural machinery industry, appearing down the rows, busily engaged in killing weeds and aerating the soil. At other farms operated on a larger scale we see the work being done by tractors. Most of the vineyards here are in the hands of large companies, and produce table grapes for the Chicago market and for sale to local visitors, though this latter work is more in the hands of small farmers. At other seasons, we

FIG. 49.—VIEW IN VINEYARD, MICHIGAN FRUIT BELT.

would see the spray wagons busily at work combating the insect pests which play havoc with the vines and tree fruits, and seriously diminish the fruit farmer's profits. Much of this district has been settled by Germans with a certain experience of viticulture. Wine is made to-day for local consumption only.

Grapes, apples, peaches, pears, and a few apricots are the chief large fruit grown. Peach trees here are liable to be killed on the average every eighth year by frosts in winter. Apricots to-day, for similar reasons, are hardly a profitable crop. The general mildness of this zone, with the prevailing winds

from off the lake producing equability of temperature conditions, makes possible this fruit belt, but by no means determines its present limits. Fruit is not much found to south of Michigan City, thus indicating the broad south limit due to the lake. Careful detailed investigation is needed to establish the absolute eastward limits, if such exist, the westward limit being clearly defined by the marsh. In watching the cultivator at work we note the light sandy character of the soil. This sandy zone back of the marsh is part of the old lake bed. In the past attempts have been made to cultivate it for mixed farming, but these have mostly failed, and fruit has become established in its place, not because fruit does not flourish equally well on the richer forest loams and prairie soils to eastward on the higher ground 600 feet above the old lake bed, but because this ground is at present occupied by other forms of activity, which have abandoned the unprofitable farming soils near the lake.

As we run north near Bridgman, we come into many acres of land devoted to strawberries, raspberries, tomatoes, and cucumbers, with an occasional field of peppermint. In the distance beyond the peppermint field is a group of buildings, the factory where the peppermint is made. In the little town we note the garages, seed and implement stores related to the specialised farming and transportation activities of the district. Bridgman does a profitable business with the local farmers and the summer tourists to the dunes, and ships many strawberries and other small fruit products to the Chicago market. From the rising ground back of the town, partly old dune formation, we get an extensive view over apple orchards, vineyards, and small fruit areas to the low line of the main dunes on the horizon, and glimpse something of the town's essential meaning as a local node and distribution centre for this part of the fruit belt, the farming country behind, and the recreational zone along the dunes.

In the fruit country, the state of repair of buildings, and the character of the cultivation is sometimes, though not always, a guide to the nature of the land occupancy. Where,

as in the case of much of the vine country, the land is in the hands of large companies, cultivation is on a high level, the implements and machines used are up-to-date, and the buildings are in good order. Where the intervals between the vines are thick with weeds, and the buildings and fences in a poor state of repair, the property is sometimes in the hands of small fruit farmers lacking the necessary capital to operate on successful lines. Co-operation here has been tried, but has not succeeded owing to lack of adequate support. Many of these farms belong to the older generation, and the apple orchards under such conditions lack the regular layout and spacing which renders cultivation easy and produces more profitable results.

A typical small fruit farm on modern lines is built of concrete blocks. It has broad verandahs and sunny rooms. The inside walls are finished in soft grey sanded plaster, without paper or colour, making an excellent background for pictures, and conveying a delightful sense of airiness and coolness. It has a bathroom and wash-basin in the principal bedroom—a luxury in this district. Its water supply, as indeed the water supply of all the fruit belt—a possible limiting factor in settlement—comes from a well sunk in the light underlying soil. The pumping is done by electricity, as is also the cooking. The farm is connected to the central exchange by a party telephone line, on which, in spare moments, one can listen in to the neighbours' calls. Around the house are shade trees and beyond lie the orchards and outhouses, including ample wooden garage accommodation, for motor transport has done much to revolutionise this district. Wild animals, other than an occasional skunk, give no trouble, but under stress of exceptional winter weather conditions in the north, stray wolves have been known to come south.

Such is the cultural landscape of this growing fruit district by the Michigan shore. It is the expression of man's adaptation of an environmental complex in which favourable weather conditions, higher summer temperatures than those of England, ample rainfall and summer sunshine, modifying lake breezes,

light, easily worked soils, the local tourist market, adequate transportation, and the relative proximity of the larger market of metropolitan Chicago combine to produce a suitable setting.

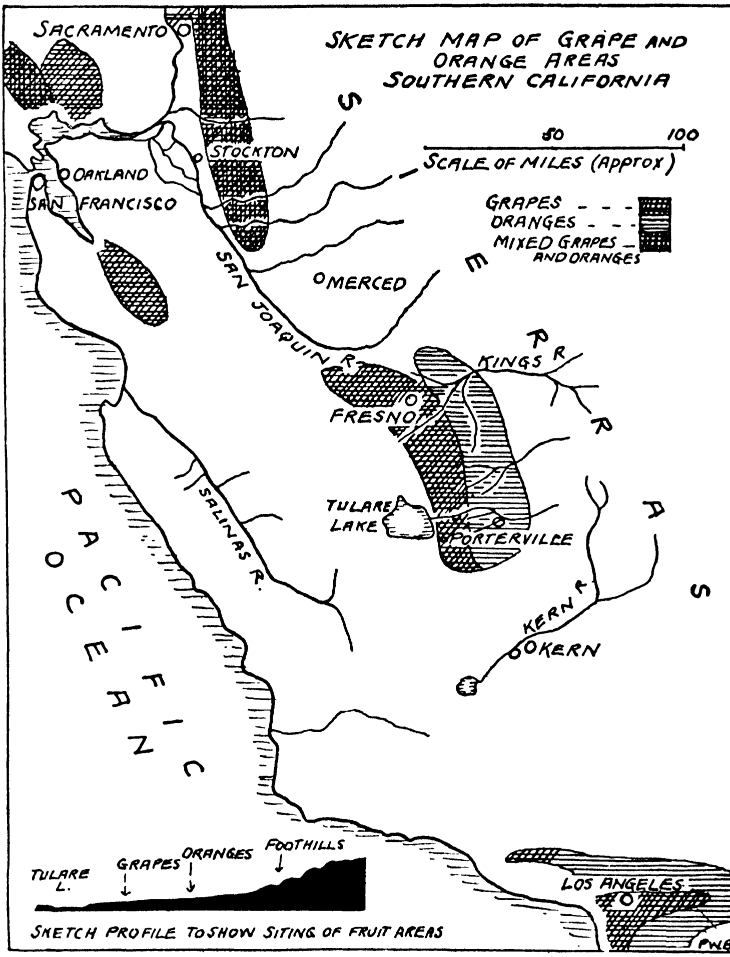

FIG. 50.—SKETCH OF FRESNO DISTRICT.

Let us now briefly examine a cultural landscape, the result of man's desire for fruit, the physical setting of which is very different. Leaving Chicago airport by plane, we can, to-day, with several changes, rapidly reach San Francisco on the coast of California. Running by car through the San Joaquin

valley, we cross its flat and marshy floor to Fresno, sited among the distributaries of the King's River on the smooth upward-sloping floor of the valley, rising towards the foothills of the Sierras (Fig. 50).

We are in the heart of one of the great grape regions of South California and not far from an important orange region. Leaving Fresno behind, we have on either hand, broad acres of vineyards, intersected by wide irrigation ditches, with here and there patches of peach, fig, and other fruit trees. Farm-houses are numerous and close together, for the typical vine-yard holding is 20 to 50 acres. The general arrangement of the farms is in rectangular lines reflecting the modern layout of the road pattern and the general flatness of the district. The villages and towns which form the community centres of the district are spaced along the railways at intervals varying from 3 to 10 miles. Schools are numerous. Farm buildings are modern and equipped with telephones and garages. The value of the land is high, averaging about $1,000 per acre. Most of the farms are in the hands of their owners, who have developed the co-operative system of supplies and marketing on a large scale.

The irrigation ditches which we have seen, reflect the arid character of this district of Southern California. If we follow them up towards the foothills, we come to the diversion dams built across the King's River to deflect its flow into the artificial channels. The heavy snows of the High Sierra, melting at the end of winter, send down flood waters into the King's River from April to July, thus providing the needed water during the growing period. After July the water is not needed, so storage dams are not required. The task of digging the necessary ditches was carried out by the massed labour of the fruit colonists. Continuing our tour, we see, here and there among the vineyards, square-looking buildings from which the monotonous chug-chug of the oil-pumps is heard. These pumps supplement the supplies from the King's River. They are more numerous in districts outside the range of the gravity supply from that source, as in the orange zone higher up. To

the north-west of the district the fruit-growing peters out. Here one is in the zone of the San Joaquin which, at this point, is flowing in a deeply cut valley of the Piedmont slope from which economical irrigation is not practicable. In the region of well irrigation the chief problem is that of the accumulation of alkali in the soil, a difficulty not encountered in connection with the clear, pure water of the King's River coming down directly from the winter snows without passing, as does the well water, underground and dissolving out salts from the rocks through which it passes. There is also a tendency under both systems of irrigation for the ground water table to rise unduly with disastrous effect on the yield of the crops.

Near the edge of the belt we note a patch of light-coloured, sandy looking soil crossed by newly cut irrigation ditches. As we approach we see it has been freshly planted with fig trees. The soil attracts our attention. This loose, light, sandy soil covers much of the district, and is that on which the bulk of the crops is grown. It is especially suited to tree crops like peaches, which are especially sensitive to soil conditions. The vine will grow on most soils, its long tap-root having been found as far down as 23 feet in clay. These light soils are the alluvial fans of the Sierra streams debouching on the flat floor of the main valley.

Running through the belt in early September, picking is in full progress. The vineyards are crowded with men, women, and boys from the district and the nearby cities. They are housed in camps. They pick the grapes and lay them on trays in long lines between the vines to cure in the brilliant South Californian sun. These form a striking temporary element of the landscape. The average summer of this district possesses about 90 per cent. of the possible number of hours of sunshine. This is its greatest asset, perhaps, to the dried fruit industry, since the bulk of the grapes are converted into raisins for sale in the densely peopled north-eastern part of the U.S.A., and under the Sun Maid brand are sold in Europe in competition with those of Mediterranean lands.

Running south-eastward through the raisin country, we

reach, on the upper parts of the Piedmont, the region devoted to oranges. In many ways the forms of the cultural landscape are identical with those we have just studied, but here the low-hung grapes give place to tree culture. Spaced well apart in long lines, the dark green of the foliage contrasts sharply with the soil. The irrigation ditches are still with us, the pumping stations and other characteristic features. Light frost which does not damage the grapes proves detrimental to citrus fruits, hence partly their location on higher ground, where the air as it drains down the slope is sufficient to prevent freezing. In this and other similar regions it is at times necessary to take special precautions against frost hazard. This is usually done either by oil heaters, one of which is placed under each tree when frost threatens, or by smudge pots which create a smudge of smoke over the orchard sufficient to check the drop in temperature. An orchard at night, under the deep indigo of the sky with the oil heaters alight, each under its tree, and the masses of dark green foliage faintly visible, forms an unforgettable picture, the expression of man's effort to run counter to nature's laws and bend her to his will. A similar expression of this effort are the sprayers at work in the vineyards and orange groves fighting insect pests, which uncontrolled would alone succeed in rapidly depopulating this flourishing fruit region, a hundred miles or more in length by half that in breadth.

We have briefly examined above some of the outstanding aspects of the cultural landscape produced by man's desire for dried and citrus fruits in a region whose physical setting is admirably adapted to the purpose. The vineyards, orchards, ditches, farms, dams, and pumping stations are its major expressions. The sloping Piedmont plain, free of vegetation, the distributaries of the King's and other streams, the underground water supply from the Sierra drainage, the deep Sierra snows, the loose, fertile, light soils, the hot Californian sunshine, particularly in autumn, the relative freedom from frost, are the chief elements of the natural environmental complex. From these man's skill and labour has moulded the

present cultural landscape, and has enabled him to compete in far-off markets with the product of older European communities.

Of the many striking cultural landscapes produced by man's desire for tropical fruits we have little space to speak. They are many and varied, ranging from banana and pineapple plantations to coconut groves, and that most intensive cultural landscape of them all—the Arab date garden. The tall, thin stems of the banana trees, with their crowns of graceful fronds and heavy bunches of fruit, the picturesquely clad figures of the Indian coolie labour engaged in picking, the oxen and mules on which the heavy fruit is loaded, the negro women carrying the bunches on their heads aboard the banana steamers, the figure of the checker counting the bunches as they go aboard, the great specially built steamers for the trade, form a striking cultural landscape set in the hot, rainy atmosphere, and rich soil of the West Indian lowlands.

An equally striking and very different landscape is that of the Hawaiian pineapple plantations, especially if seen when the plants are young. The fields from a distance look as if painted in narrow white lines. These are the strips of paper, in holes cut in which the young plants are set. In this way the growth of weeds is kept in check, cultivation is reduced to a minimum, and in time the paper decays and disappears. The plants by then have made vigorous growth. Later the long sword-like leaves, with, in the centre, the swelling pine, in regular lines, is a characteristic sight. In the distance a group of plantation buildings, with perhaps a canning factory, complete the picture. The physical setting is the rich, moist, but commonly light volcanic soils of the Hawaiian lowlands.

Perhaps the most graceful and attractive landscape resulting from tropical fruit production is that of the coconut plantations in the Philippines. Here the tall graceful fronds of the palms with their clusters of nuts, the trees set 30 feet or so apart in long lines, on the shores and rivers of the wet eastern side of the islands, where ample subsoil water is available from the neighbouring mountain lands in the rich

volcanic soil, give a characteristic touch of beauty to the landscape. The many rivers are utilised to float the nuts, loosely linked together into great rafts, to the shipping points. The bulk of this fruit is marketed, not for eating purposes, but in the form of oil, in the export of which to-day the Philippines, under efficient American supervision and highly favourable natural conditions, stand easily first among the world's producers [2].

Lastly, we may glance at the cultural landscape of the Arab date garden, sited amid the sands or stony areas of the world's hot deserts [3]. Crossing the sandy, stony wastes of the Sahara, we see peeping above the dunes or stony ridges the light, graceful fronds of the date palm. Approaching, we look down into a hollow, laboriously scooped in the sand to reach the life-giving water layers beneath. The hollow is full of date palms. Underneath, as we approach, we see the smaller apricot and fig trees, which form as it were a second tier of cultivation. A still nearer approach reveals beneath, at the foot of the trees, barley patches and beans, while twining through the underbrush are huge vines, the whole forming a veritable tropical maze, yet carefully tended and cultivated. In the sandy areas no water is visible, for the trees reach underground supplies from the dunes, but in the stony regions, the small retaining dams, in rocky hollows, the wells worked by slope and pulley, man, camel, or mule, the small irrigation channels, are constantly in service to feed the thirsty earth. In these oases, the cement and stone-built houses of the dwellers are scattered amid the palms and in groups on the outside edges. In the sand oases, the inhabitants live in tents, for they are rather nomads than settlers, owning, together with their date gardens, flocks and herds which graze on the stunted vegetation of the moister dunes. No part of the date palm goes to waste. It is the desert staff of life, the bread and in large part the meat, of those who dwell there, giving from three to twenty fold the yield of wheat and containing greater nourishment than beef. The Arab, provided he can get his handful of dates and sufficient water, is largely remote from

civilisation's food and drink problem. Such are the main forms of the cultural landscape, over a vast region of the earth's surface, the hot deserts, in which man wrests, in the form of fruit, his principal support, from an environment the surface of which is most repellent, but below which, in favoured spots, and in the atmosphere above, are conditions which, brought together by human skill and toil, and applied to the unprepossessing soil elements, yield his daily bread.

The appearance of the cultural landscapes of fruit-growing districts varies greatly with the particular demand satisfied, the cultivation methods employed, and the nature of the market demand. These in turn vary with the elements of the environmental complex. Of these temperature, rainfall, slope, and soils are perhaps chief. Thus it is temperature together with rainfall which in the main determine the differences between regions suitable and unsuitable for temperate, subtropical, and tropical fruits. It is aridity coupled with temperature which renders possible such a region as the dried fruit area of southern California, with its characteristic vineyards, orchards, and irrigation system. It is slope and soils which are the chief elements of the physical setting of such a region as the Wisbech area in the Fens. Over and above the major differences in appearance thus produced, the character of the landholding makes differences which may be very marked as between the plantation cultivation of many tropical areas and the smallholders of the Evesham region. Similar differences are found in the dwellings of the various areas, though to a less marked degree.

In spite of many differences, fruit regions everywhere have numerous points of resemblance. The plots and fields are more intensively cultivated, thus giving more of a garden appearance to the landscape. This usually results in a more regular layout in lines or rows. The greater numbers of people needed for such forms of cultivation result in more dwellings, giving the region a more densely populated appearance, accentuated at harvest time by the influx of still greater numbers to meet the more urgent needs of that season. The

development of canning and other methods of preserving fruit and vegetables results in factories and canning establishments appearing in rural areas, units normally absent from the landscape of pasture land and arable farming. The land, commonly but by no means invariably, utilised for fruit, is of the lighter type. It is usually either land which was waste land, or land the value of which for fruit purposes is greater than that for other uses, or land which has not been already pre-empted for other forms of land occupancy.

In our survey of some typical fruit areas we have had to omit much of interest, but we have endeavoured to bring out some of the more striking aspects of the cultural landscapes which result from man's adaptation of his physical environment, in the effort to satisfy the present large and growing demand for various forms of fruit.

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its essential meaning, what are these people doing, and how are they related to their environment ?

Running into Chicago by rail along the New York Central tracks in the Twentieth Century Limited, having come by the Hudson–Mohawk Gap to the La Salle street terminus, or via the Susquehanna–Juniata route of the Pennsylvania railroad, in the Liberty Limited to the great Union Terminal on West Adams, one gets one's first hint of what the city means, for Chicago is the focal point of a fan of great railway tracks, over fifty in number, radiating to all parts of the U.S.A. Here the bulk of passengers and goods tranship if going farther. Here is the farthest lake re-entrant into the Corn Belt. Here is the southern head of the greatest system of inland waterways in the world. Here, in pre-railroad days, was a lake port, the most northerly point by which a traveller from the East could pass into the north-west. Here, still earlier, the French explorers moving to the Mississippi, found a short portage from the Lakes via the short Chicago River to the Desplaines River and the Mississippi system. Here, when St. Louis, its great rival to the south as a starting-point for the Far West, the final stage on the Pittsburg–Ohio route, declared for the South in the Civil War, began the development of the railroad net which is the essence of Chicago's position to-day.

A study of a railroad map of the United States to-day shows the cultural landscape produced by this net fanning out in a long projection to north-west, thinning on the edge of the semi-arid grassland stretching away to the Rockies. Directly westward it thins out more abruptly in Nebraska and Kansas in similar country. To southward it projects between the Ozarks and the southern Appalachians down the Mississippi valley. To eastward it focuses on the Hudson-Mohawk Gap and the river valleys of the Appalachians. To northward it again thins in the forest country of Minnesota and Michigan. Within the area thus broadly defined is the greatest large-scale traffic concentration in the United States, lying mostly within a 500-mile radius or one night's run of the " Windy City by the Lake," as Chicago is termed.

Within this zone are three other great regional centres, each, in a sense, tributary to the city by the lake. To the north-west are the twin cities of Minneapolis and St. Paul, a great flour-milling centre based on the Falls of St. Anthony and the nearby wheat belt; to south lies St. Louis, a distributing centre for the west; to the east is Pittsburg, of which more anon. Within the zone is also a series of minor centres specialising in specific activities, of which the automobile

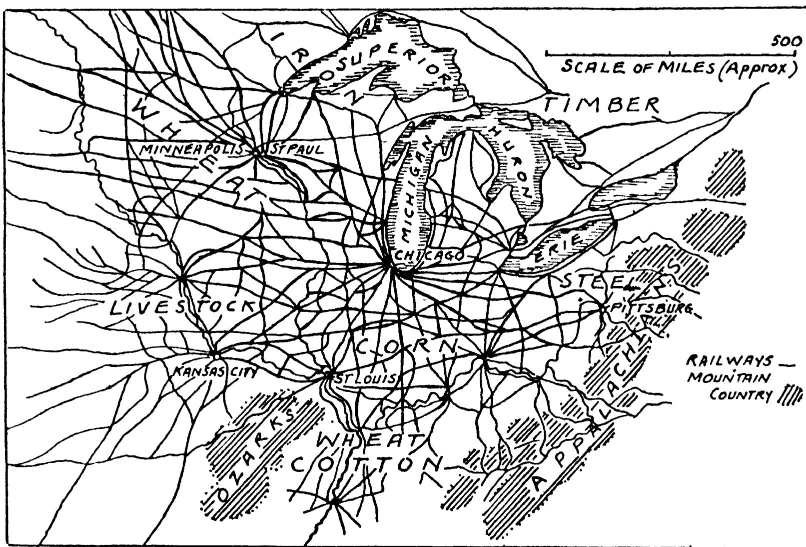


FIG. 51.—RAILWAY CONCENTRATION AT CHICAGO.

industry of Detroit, the headquarters of Henry Ford's plant, may be taken as a type.

Within this region of the Middle West or Northern Interior, the land is level over long stretches. There are few natural obstacles to the construction of railways. The steel tracks can be laid cheaply mile after mile almost in a straight line. Tunnels, embankments, cuttings, bridges, and viaducts are conspicuous by their relative absence (Fig. 51). Mile after mile the monotony of the track is unbroken by the diversified forms forced on man by nature in less level country. The net-like railroad pattern is amazingly regular. Great distances do not here, as in other less-favoured lands, make

themselves correspondingly felt in the cost of transport per mile of track, a fact to be borne in mind when considering the hinterland of Chicago. The motor-roads from west, south, and east, focusing on the city, are built with similar ease, hampered only by the soft material of the prairie surface. The bus and truck and automobile traffic on these roads is very fast, rivalling in speed that of the railways, and increasing the concentration of movement on the city, once established as a focal point. Some of these roads utilise the gravel ridges left at the edges of the retreating ice sheets of glacial times.

The lake traffic concentrated on the harbour works at the mouth of the Chicago River has, to-day, relatively declined and is almost entirely confined to bulk cargoes of coal, grain, and timber. It has been surpassed by the ore, coal, and grain traffic of the Calumet River in the steel district south of the city. The construction of the deep waterway canal now in hand through the trench cut to the south-west by the overflow of the greater Lake Michigan, ice-dammed in the glacial period, the present route of the drainage canal, may produce a change, and will place Chicago at the crossing point of a water route from the Great Lakes to the Mississippi, and of a rail route from the north-west wheat and ranching areas to the south-eastern prairies.

Chicago is thus, in essence, a traffic node, probably the greatest in the world, a focal point where nearly one-half of the railway mileage of the United States terminates, a meeting-point, and probably a crossing-point of water and land transport. It has focused within itself the activities which these things imply.

What is the justification for this vast traffic concentration? Railroad and water terminals and their related equipment of fixed and movable elements of the cultural landscape represent heavy expenditure of capital and human effort. They are built to handle goods and passengers, not for philanthropic purposes but to earn money. As the city's activities are concretely expressed in its cultural landscape, we may well begin our study of them on leaving the Union Station, by taking a

yellow taxi-cab down the crowded thoroughfare of Jackson Boulevard towards the lake and up North Michigan Avenue to the Tribune Tower, nearly 500 feet high, from the top of

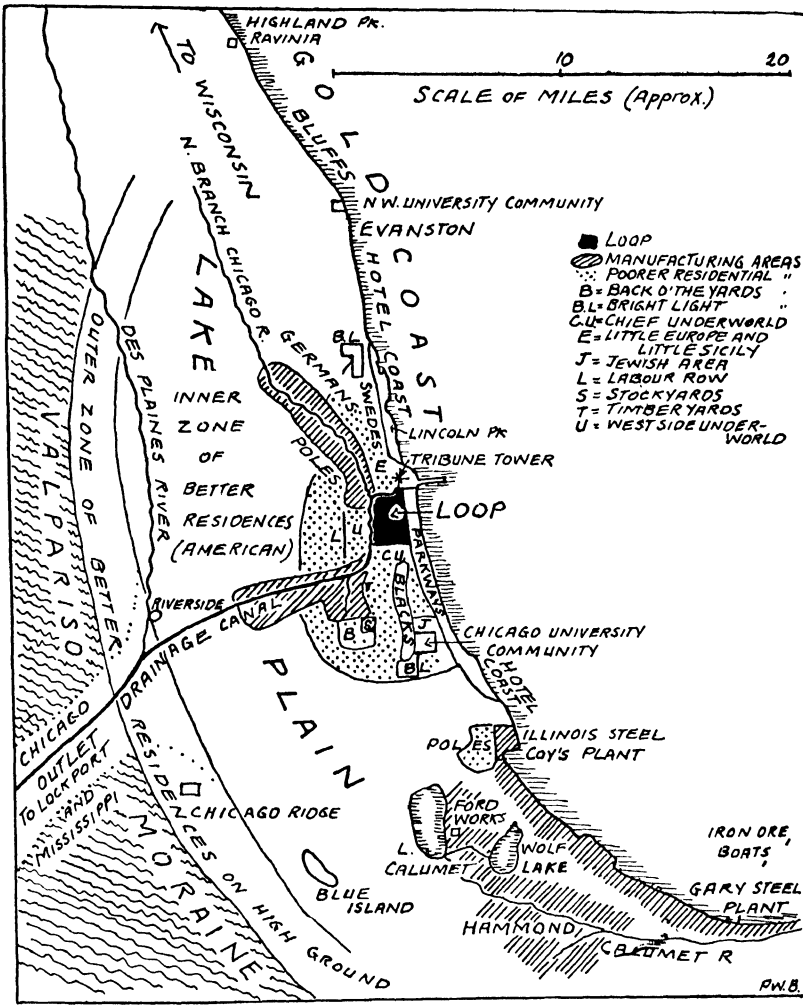


FIG. 52.—GENERAL MAP OF CHICAGO AREAS.

which, on one of those clear days for which Chicago is justly famed, we get an excellent view of the city's layout (Fig. 52). On our way, in the very heart of the city, at the junction of La Salle Street and Jackson Boulevard, we pass the famous

Board of Trade Building, the Wheat Pit, which till recently dominated the whole of the wheat trade of North America.

Looking southward from the Tower, we note first the city's rectangular layout, which is based on the intersection of Madison and State Streets. From here all numbers run north, south, east, and west, dividing the city into rectangular blocks, each one-eighth of a mile containing one hundred numbers, and making it very easy to find one's way throughout the city. About one mile to west of us, the junction of the north and south branches of the Chicago River divides the city into three parts, known as the North, South, and West sides respectively. The North side, we note, is mostly a residential district with, towards the river to south-west, a number of manufacturing plants, of which one of the chief is a branch of the International Harvester Company. The South side is also a residential district with, again towards the river, groups of manufacturing plants and in the far south a group of steel mills. The West side is mostly residential with, towards the river, further groupings of manufacturing plants and lumber yards. Immediately at our feet, just to southwards of the main line of the Chicago River, is the district known as the Loop, the heart of Chicago, containing the chief shopping, administrative, and financial buildings, with the principal wholesale district immediately to west of it, between it and the south branch of the Chicago River. The chief printing district lies just south (Fig. 52).

Taking a wider view from our vantage point, we look far to the south-east across the corner of Lake Michigan to the low sand-dune coast near Michigan City and Dune Park in Indiana, the summer playground for the city. To right, the smoke-wrapped steel mills of Gary and South Chicago, with a number of long, low iron-ore boats crossing the lake, are the chief visible elements of the cultural landscape. Nearer to hand the skyscraper hotels of the residential district known as the "Hotel Coast," some seven miles away, fill the picture. After a short break, the line of the skyscrapers is continued on the west side of Michigan Avenue, Chicago's magnificent

thoroughfare, facing over a distance of one mile on the Lake Front. Between the avenue and the lake is Grant Park with the Field Museum and the Amphitheatre, and to south of it the steam shovels and pile drivers are busily at work reclaiming the lake bed to continue the Parkway system southward to the "Hotel Coast."

The clay and sand of the old lake bed made the layout of the city simple, but presented a serious problem to the builders not merely of the skyscrapers, but of any massive building in the city. Bedrock, a limestone pavement, lies 80 feet below the surface. Over this, sand, covered by a thin veneer of clay and saturated with water to within about 8 feet of the surface, was the foundation which faced them. After some disastrous experiments of building on the sand, the problem was solved, partly by carrying the greater structures sheer down to bedrock and partly by the creation of artificial foundations in the shape of huge concrete blocks or platforms, made by pumping liquid cement into the excavation prepared for the foundations—a solution rendered by no means easy through the relatively high level of the water-table in the porous material. Owing to the thin layer of soil and the underlying porosity, soil for garden layout in the residential districts and in the parks has to be carted from many miles westward on the prairies. Grass in these same areas, during the summer season, under the combined influence of the porous subsoil and the intense sunshine, needs almost daily sprinkling to remain green—the sprinklers being very characteristic. Fortunately there is no lack of water in Chicago with the Great Lakes at its front door.

Returning to our viewpoint from the Tribune Tower, we could see, were it not for obstacles in our way, some five miles to the south-west, in the South Side District, the 450 acres of the Union Stockyards, the surrounding meat-packing plants, some fifty in number, and the Cattle Brokers' Exchange, which more than any other single factor, apart from transportation, has contributed to the building of the city. Taking a south-side Elevated Railroad car to Indiana Avenue and changing to

the Stockyards Branch, we find ourselves in the middle of the cultural landscape of Chicago's greatest activity. The Union Stockyard pens, with their accommodation for approximately 500,000 animals, are the heart of the immense meat-packing industry of the city [1]. The yards are merely a receiving centre for livestock, and are managed as a huge livestock hotel, the management having no interest in prices as such. The animals are shipped for sale at auction from the Corn Belt by farmers to commission men, whose offices adjoin the yards. The buyers are chiefly the agents of the packers, local butchers, and exporters. Around the yards are the packing plants of Armour, Swift, Libby, Morris, Wilson, Hammond, and many another name, familiar, not merely in "Packingtown," but throughout the world. In the yards and packing plants we note the U.S. government inspectors, who rigidly inspect the animals and meat as they pass through to become bacon, hams, and meat products, which are finally canned to feed the teeming multitudes of this and other lands, for there are few, if any, parts of the earth to which the meat products of the Chicago packers have not penetrated.

Around the yards is the residential district, for the most part ramshackle apartment buildings, in which the employees of the meat packers and of the yards live. Of these, the district immediately to the west, called 'Back-o'-the-Yards,' is known throughout the United States. The home of hard-working Irish, Poles, Lithuanians, and Czechs, it is also the home of beer-runners and gangsters, and the scene of many shootings and murders resulting from gangster disputes over illicit beer and spirits. No mention of the stockyards is complete without reference to the odour, the all-pervading odour, which permeates 'Packingtown' like a second atmosphere, and which, with a south-west wind blowing, is 'felt' in many parts of the city [2, 3].

Such are the chief aspects of the cultural landscape of 'Packingtown,' an objective expression of one of the major activities of the great Corn Belt to south of the city. This belt is the heartland of America. It is the centre of the Northern

Interior, a region producing over half, in value, of all the farm products of the United States. Of these, livestock stand second to cereals. Of the cereals, by far the greatest is corn or maize, of which one-third is marketed in the form of hogs, and one-third as cattle. Of the hogs nearly three-quarters, and of the cattle nearly one-half, are in the Corn Belt, in the railway net already described, within a night's run of the city. Within the zone of the Northern Interior is also found over half of the hay and forage crops and nearly two-thirds of the land under farms (in value) [4].

From the edge of the High Plains to the Appalachians, a distance of 1,000 miles, and from the Laurentian Shield to the southern limit of glaciation, some five hundred miles, the land is level, the soil is deep and fertile, and the country is well-watered. The rainfall of from 20 to 50 inches is ample for cultivation. The growing season, varying from 110 days in Minnesota and Wisconsin to 190 days in Missouri and Kansas, is sufficient for cereals. (For fuller description of the Corn Belt, see Chapter 8.) It is the richest and most prosperous agricultural region of its size on earth.

In spite of competition from St. Louis, Kansas City, and other meat-packing centres, the bulk of the livestock moves in by rail to south-west Chicago. The effect is cumulative, for not merely do the farmers sell their products there, but they buy their supplies in the city, which since the middle of the nineteenth century has grown to be the chief meat-packing area of the United States.

Meat and bread are the staple foodstuffs of most human beings. On entering the city at the junction of La Salle Street and Jackson Boulevard, we pass the Board of Trade building, the famous 'Wheat Pit' [5], wherein is focused the grain trade of the United States, and, till recently, the grain trade of the world. Entering the building and climbing to the second-floor galleries, we look down on hundreds of men in alpaca coats wildly gesticulating in sign language in the midst of a din in which, to the uninitiated, it would appear impossible to transact any business. On huge telegraph

boards the ruling prices of the different grains dealt in are prominently displayed. Behind all this pandemonium an orderly system prevails, the key to which is the sign language used by the brokers in buying and selling. The clenched fist indicates the price in even cents. Each finger raised indicates an added eighth of a cent up to five-eighths. Other signs stand for the other fractions, and a slight motion of the hand to or from the dealer signals whether he wishes to buy or sell. Thousands of bushels are rapidly changing hands, and both the farmer's purchasing power and the ultimate price of bread and animal feeding-stuffs to the consumer fluctuate in sympathy with these vast transactions.

Around the trading room are the offices of the brokers and commission men to whom the wheat is consigned for sale. On the Chicago and Calumet Rivers are huge elevators, some sixty in number, to which the grain moves by lake and rail. To see these in perfection we would have to visit Duluth and Superior at the head of the lakes, for, though the buying and selling of wheat is still centred in Chicago, thus illustrating the momentum acquired by an established market, the bulk to-day moves not through the city, but through the upper lake ports, at which the great elevators, the vast railroad sidings, the wharves, the wheat ships, the railroad cars of grain, and the human element controlling this movement, constitute a striking picture of the elements of the cultural landscape relating to wheat marketing.

Let us now see the source of all this trade in breadstuffs and animal foodstuffs. Far to north-west of the city, over 1,000 miles of prairie, stretches the great spring wheat belt, of which approximately half is in the U.S., and half across the border in Canada [6]. Here, as in the Corn Belt to the south, level land, rich soil, adequate summer rainfall, railroad transportation, and energetic settlers, have contributed to develop the largest single wheat-producing entity in the world. To south-east and south of the Corn Belt, on unglaciated lands less rich than those of the Belt, from mid-Nebraska and Kansas to the Appalachians, yet well within the sphere of Chicago's

influence, stretches the winter wheat belt, contributing, together with the by no means inconsiderable quantity of wheat grown under rotation in the Corn Belt itself, its quota to the dealings in the 'Wheat Pit.' Within the regions thus defined are to be found some 70 per cent. of the acreage under wheat, 76 per cent. of that under oats, 83 per cent. of that under barley, and 75 per cent. of that under rye in the United States —an agricultural empire, the financial and control focus of which is, in a very real sense, the Chicago Board of Trade Building.

Closely linked to the development of this vast agricultural area, the Harvester Building, on Michigan Avenue, south-east of the 'Pit,' is the headquarters of the International Harvester Company, built in the main through the vision of one man, who, in 1847, saw Chicago as the natural focal point for the lumber of the northern forests, and the market for agricultural implements to the south and west. This building, together with the acres of lumber yards and farm implement manufacturing plants on the south branch of the Chicago River some four miles away, may well serve to typify the cultural landscape of this vast activity, without which the large-scale production of the prairie lands would have been seriously hampered and delayed. Cyrus H. McCormick, the inventor of the reaper, saw that the lumber schooners from the northern lodging camps could come alongside the south branch of the river from the lakes, and discharge their cargoes where the great lumber yards have grown steadily in size from that day onward. He built his great plant, and others such as Edward Hines followed him. From this plant, binders, mowers, reapers, and twine, and every kind of farm implement, go out to the agricultural areas beyond the city, and not to them only but to most parts of the world. To-day a tour through the main plant, including the foundry shops, rendered necessary by the increased use of steel in the products, takes about two hours.

Back of this activity, and, from our point of view, focusing on it, are the northern coniferous forests around the lakes and in

Michigan, in which the white pine, the most valuable lumber tree, predominates, and the eastern hardwood forest, stretching from Chicago to the Atlantic. The white pine was cut in the logging camps in winter, sleighed to, and piled on the frozen waterways, and floated down with the spring thaw to the waiting lake schooners. This northern area with its rough topography and well-distributed rainfall, is the natural home of timber, from which the white pine has been largely cut out, but it is slowly replacing itself, since, being mostly unsuited for agriculture, the forest has not been removed to make way for cultivation, a fate which has overtaken most of the eastern and southern forest country.

The Furniture Mart on Lake Shore Drive, reputed to be one of the world's largest buildings, with its floor space of over thirty acres, typifies another aspect of the city's lumber trade—the furniture industry. Chicago manufactures and sells more furniture than any other city in North America—a fact due to its commanding position, both from the standpoint of timber supplies and that of its enormous markets for the products of the industry, in the city itself, and in the millions of homes of its great hinterland.

In our earlier view from the summit of the Tribune Tower, we saw, far to the south, over the south-west corner of the lake, the ore boats carrying their loads to the artificial harbour, built in the sandy marshland of the old lake bed, around which has grown up the steel town of Gary. From here the black smoke-stacks of the steel plants are seen at intervals over a distance of twenty miles, to the southern end of the city, the last being those of the Illinois Steel Company at 79th Street. Running south on the Illinois Central and Père Marquette lines, we enter beyond 100th Street, near Lake Calumet, a wilderness of manufacturing plants, sprawling over the face of the countryside, among which the Ford Motor Plant, the Pullman Car Works, and the varied steel products works around Hammond, stand out prominently as illustrating three of the typical steel manufacturing industries of the great district vaguely known as South Chicago. The first two of

these are the natural *outcome of Chicago's position as a transportation centre.*

Reaching Gary, we can study the striking development of the cultural landscape brought about by the steel industry operating on a large scale, for here, outside of Pittsburg, is found the largest development of that industry in the Northern Interior. This development is all the more remarkable, taking place as it does under what at first sight appears to be the relatively unfavourable location—over 800 miles from its iron-

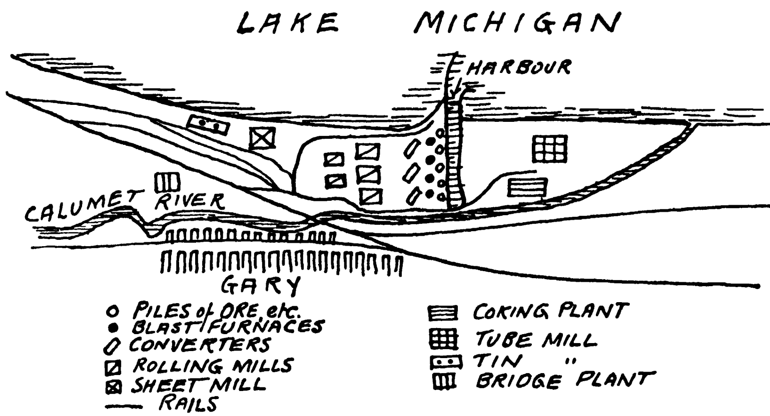


FIG. 53.—LAYOUT OF STEEL PLANT AT GARY.

ore supplies and a similar distance by water from its supplies of suitable coking coal.

The layout of the great steel plant at Gary, following the latest modern practice (Fig. 53), is designed to utilise to the full the economies effected through never allowing the raw material to cool in its transit from the blast furnaces to the finished steel. The low-lying, heavily laden lake steamers discharge their cargoes of iron ore, coal, and limestone, at the long north-south wharf of the artificial harbour. Great steel grabs, coupled to electrically operated cranes, each capable of lifting 15 to 20 tons of material at a grab, unload the 10,000 or 12,000 tons of cargo in from two to three hours, dumping it in stock piles on the ample space available, for lake transport is only possible from the end of April to early December, and economical working requires the storage of

sufficient materials to keep the plants running during the whole year. Fortunately, cheap land, too wet or sandy for agriculture, was obtainable at Gary, on the water front, outside the range of city building operations and speculators, but easily linked by belt-line rails with all parts of the city.

Backing the piles of raw material are the blast furnaces, belching forth smoke and fumes. Nearby are the coke ovens converting the coal into metallurgical coke. We note also the water-cooling plant and the gas recovery plant. The intense heat developed necessitates water-cooling for efficient working, for which purpose lake water is available in unlimited quantities, an increasing need in modern steel plants and an important factor in their location. It is estimated that for this and other purposes throughout the plant as much water is used daily as for all the municipal services of Chicago itself. The gas from the coke-oven plants, together with that from the blast furnaces, is used in heating the furnace blast, and the surplus left operates most of the machinery, drives the dynamos and unloaders at the wharf, and helps light the city of Gary—a striking illustration of the economies of large-scale production.

Behind the blast furnaces are the Bessemer converters, which, by extracting the carbon acquired in the smelting process, convert, in an operation lasting about ten minutes, the molten iron into molten steel. From them the white-hot steel, passes to the rolling-mills behind, and is rolled out into steel rails, plates, bars, rods, and other structural shapes, to pass in their turn to the sheet mills, the tin mills, the tube mills, the bridge plant, and other finishing departments, and to emerge in some cases four miles from the starting-place at the docks, ready for shipment at the railroad switching yards. Most of the buildings are low, broad, one-storied structures occupying much land, for such bulky products do not lend themselves to economical handling on more than one level—another example of the advantages accruing from the relative abundance of cheap land, which makes such layout feasible, at low cost.

To complete our picture of the main aspects of the cultural landscape of this immense enterprise, we must follow the ore boats on their return journey northward through the Soo Canals to the tall loading piers of the ore docks at the head of Lake Superior, at Duluth, Two Harbours, or Superior, and watch the iron ore, after its rail haul of eighty miles from the Mesabi mines, being dumped from the cars into great hoppers below the track, from which it pours, through many spouts, into the waiting holds of the steamers, with such rapidity that a 10,000-ton boat can be efficiently loaded in less than one hour. From there we take an empty car inland to the mines and look down, as at Hibbing, into one of the great excavations, as much as half a mile across and several hundred feet deep, which scar the face of the countryside, and from which the ore is torn by steam shovels, in bites of 5 to 10 tons, to be dumped direct into the long trains of hopper cars, waiting, when filled, to wind slowly out of the pit, on their long journey to the coast. In such fashion has man's inventive genius, co-operating with nature, made it possible to utilise the rich ores of this remote region to feed the furnaces of south Chicago. For here is the greatest deposit of iron ore yet worked in any area, the ore bodies lying some 50 feet below the surface, covered with loose friable material, sand, and gravel left by the great ice sheets, and easily removed by modern methods. The ore is a hematite, high grade, and running 50 to 65 per cent. of metallic content, and though leaner ores are now being worked, nearly one-fifth of the iron-ore resources of the world are computed to be still here. These favourable natural conditions,

FIG. 54.—SKETCH OF IRON ORE MINE, HIBBING.

coupled with the marvellously efficient methods of handling, and the relative cheapness of the water haul, have enabled the steel industry of Gary to offset the handicaps of distance from source of this raw material [8] (Fig. 54).

Following an empty coal boat northward, leaving the entrance to the Soo Canals away to port, we turn southward into Huron, and passing through the canalised Detroit River, we dock on the south shore of Erie. Here we see coal boats loading rapidly and efficiently the product of the West Virginia mines in the New River district, where coal is won from the mines high up in the side of the river valley, lowered down gravity inclines to the tracks by the river bank, and hauled to Lake Erie ports. Again we observe a minimum of manual labour and a maximum of mechanical contrivances, partly developed through the highly favourable natural conditions, and partly made necessary to cut costs in bringing a high-grade coking coal, absent from the Chicago region, to the steel centre we are studying. Some of this coal moves by the shorter distance direct by rail to Gary, but the bulk uses the cheaper, though longer, route of combined rail and lake [9].

To south of the river at Gary are rank after rank of the humble frame dwellings housing the workers in the industry. The surroundings are inexpressibly sordid to one coming from the spacious boulevards of Chicago. They are not perhaps very different from similar housing schemes elsewhere, and have, perhaps, a slight advantage in the ample room available on the cheap land in the vicinity. Of the present and possible recreational areas near by, we speak later.

Such, then, are the main elements of the cultural landscape of the great steel industry focused in the Chicago district, to the growth of which, at present, it would be difficult to foresee limits, for it has in its vast hinterland as yet a population of but 50 millions, while a similar area in Europe carries some 250 millions. The railroads alone focusing on the city absorb from one-third to one-half of the output of steel and iron; the agricultural regions which they serve demand ever-increasingly farm implements, tools, and wire fencing; the

road-transport systems require automobile parts and spares; the oil industry needs pipes and machines; the Metropolitan District, itself, consumes immense quantities of structural steel, quite apart from the steel and iron used in its many manufacturing plants, such as the great Westinghouse Electric Company's works of 200 acres, on the west side of the city, with an output of about 90 per cent. of the telephonic equipment of the U.S. and a staff roll of over 40,000 people, and the Stewart Warner Speedometer Corporation on the north side. In addition, the city uses much wire mesh for highway foundation, piping for water supply, sewerage and draining, and steel furniture for its immense office blocks.

On the south shore of Lake Superior, within water haul of the city, are great deposits of copper, while to south, in the Missouri and Mississippi valleys, are the largest deposits of lead and zinc in North America—all of which contribute to the growing electrical industries of this modern metropolis by the lake shore [10].

To-day the Northern Interior produces rather more than half of all the major farm products, excluding specialised crops like cotton, raised in the United States, and makes slightly less than half its total of manufactured goods [4]. These human activities are growing and will continue to grow with increasing population density and intensive cultivation. The purchasing power of these huge, expanding, human activities, is some measure of the present and future market for Chicago's industrial products. It is, perhaps, unnecessary to add, that from the standpoint of manufacturing industry Chicago stands far ahead of all competitors in the Northern Interior and ranks second only to New York in the United States.

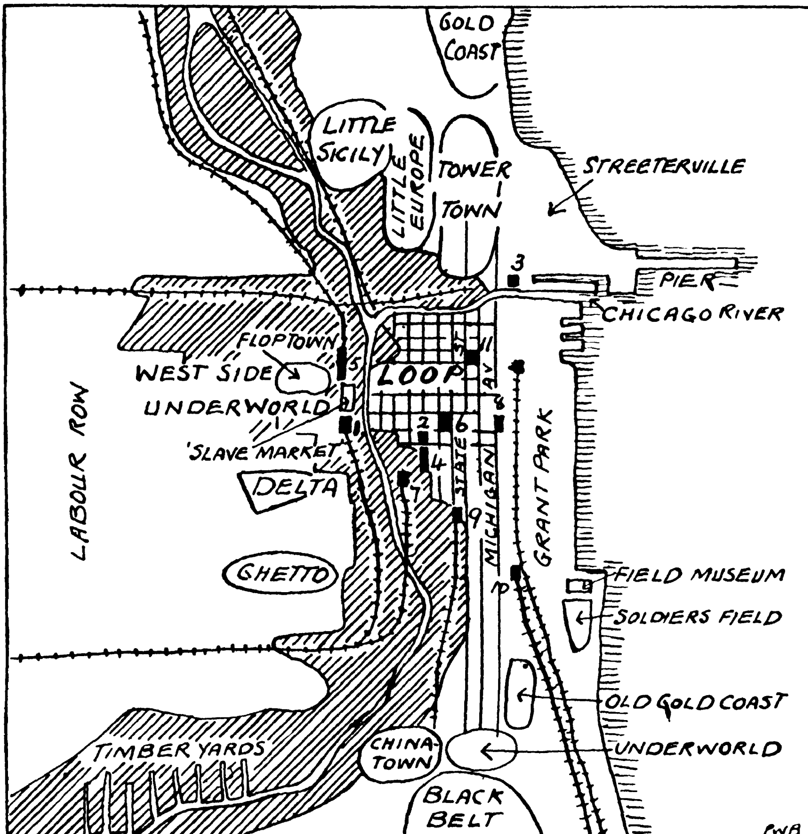
Returning from Gary to the heart of the city on State Street, we find the store of Marshall Field and Co., reputed to be the greatest department store in the world, which with many others of a similar type in the neighbourhood, is a unit of the cultural landscape of the city, symbolising her vast retail business built up on the needs of her urban population, on those of her immense hinterland, on the fact that Chicago

is a transhipment point where people change trains and make purchases, and on the opportunities for shopping in the metropolitan centre, provided by the many conferences and conventions—business, political, and social—held at the focal point by the lake. The business of her great hotels, of which Palmer House and the Hotel Sherman may be taken as types—the latter a noted political headquarters for the two chief parties—is built up on the patronage of such visitors to the city. For the less fortunate stay-at-home folk, Montgomery and Ward's Mail Order House, to west of the Loop, provides many of the opportunities to be obtained by shopping in a great city, as indeed do other houses.

Linked to these activities and forming an essential part of them, located on South Water Street, convenient to the river and the railway stations, and covering five-eighths of a mile, are the great wholesale markets handling such foodstuffs as butter, eggs, fruit, vegetables, and poultry. Before business hours a steady stream of wagons and trucks from the railroad terminals and direct from the farms, pour into the market, and the warehouses and sidewalks are piled high with the perishable products destined to feed the city—a striking picture forming an integral part of the cultural landscape of the metropolis.

No sketch of the city, however brief, would be complete without a glance at the residential districts, the distinctively national quarters, and gangland. Any detailed examination here would be impossible, but brief reference to some of the outstanding areas may be attempted. We have seen that the heart of Chicago is the Loop, containing the shopping, financial, and municipal headquarters, with immediately to west, the wholesale markets. Backing it to north-west, west, and south-west is a manufacturing belt, the fusing as it were of the ends of the two major manufacturing districts lying along the north and south branches of the Chicago River. This zone also contains the great railroad terminals and their related equipment. Grouped to north, west, and south in a third zone or area, intimately linked to the factories and railroads, is the Chicago Underworld, although the term is

more specifically applied to a small district south of the Loop. Here in the poorer quarters of the city are the chief national quarters, the centres of labour activity, and the headquarters of gangland (Fig. 55).



MANUFACTURING AREAS
CHIEF STREETS
PROMINENT BUILDINGS

1. Union Station.
2. The Wheat Pit.
3. Tribune Tower.
4. La Salle St. Station.
5. N. Western Station.
6. Federal Building.
7. Grand Central Station.
8. Art Institute.
9. Polk St. Station.
10. Illinois Central Station.
11. Marshall Field Building.

Fig. 55.—CULTURAL FEATURES OF CHICAGO.

To examine some of the aspects of the cultural landscape of these residential areas, or slums, we turn first to the 'wilderness,' or 'west side badlands' as the newspapers sometimes style it. The heart of the region lies beyond the Chicago

River between West Madison Street and Roosevelt Road. It begins near the railroad terminals in the so-called 'Slave Market,' as blocks of employment agencies for railroad and migratory labour, a reflection of Chicago's focal position in transport, and in relation to the mining, agriculture, lumber, and unskilled labour demand in her great hinterland. The area is effectively described in *The Hobo*, by Nels Anderson. Beyond is 'Floptown,' a wilderness of decaying buildings, tenements, and frame structures, cheap lodging-houses and lofts, wrapped in soot and dirt, where the down-and-out of all nationalities under heaven sleep and wait for work, sit smoking on the kerbstones, or stand about in little knots and groups. A busy point in the district is the police station and court house. Immediately to west is a rooming house district full of cheap hotels and lodgings, mainly occupied by labourers and foreigners working in the city wholesale markets or adjacent manufacturing areas.

To south we pass into distinctively national quarters occupied by Italians, Jews, and Greeks. Of these, the Delta or Greek Colony, roughly shaped like the Greek letter, and the Italian Colony, in which was the headquarters of the iniquitous Genna Brothers gang, and the scene of many shootings and murders based on disputes over the illicit trade in alcohol, lie nearest to hand. In the latter district, at a christening party in a gale of wind, started the appalling Chicago fire of 1871, which, coming at the end of a dry summer, in two days reduced the city to a heap of smouldering ruins. In the conflagration the cultural landscape of the city of those days disappeared, and practically the whole cultural landscape of the city of to-day dates from that disastrous event—a date recorded for posterity by the Chicago Historical Society on the front of a building marking the spot where the outbreak occurred, in the terse words, "The Great Fire of 1871 originated here and extended to Lincoln Park."

To south of this is the main Jewish quarter, 'The Ghetto,' focusing on the crossing of Roosevelt Road and Halstead Street, a relatively prosperous-looking business centre,

though adjacent is the 'Ghetto' market-place, a centre of teeming humanity, dirt, and smells, and varied products offered for sale. South of the railroads is an eastern European district, the home of Poles and Lithuanians, and gangs engaged in stealing from the great railroad depôts, an urgent and pressing problem for solution by the Chicago police force.

To west of the above districts, on Ashland Avenue, lies 'Labour Row,' the centre of organised labour, the site of its headquarters and meeting-halls, the scene of much stormy debate and at times bloody strife, and strategically located in relation to the manufacturing and railroad districts to north and south, and the underworld to east.

All the above areas are linked to the central manufacturing and railroad activities, and their main function is to shelter, feed, and perform other necessary services for the workers employed in them. Similar areas flank the north-western and southern industrial zones. To the north, on the south side of the Chicago River, the manufacturing area is bordered by the main Polish colony, balanced on the east side of the area by an Italian quarter known as Little Sicily, the heart of which is the infamous 'Death Corner,' in 'Little Hell,' at which point Sicilian feuds result in frequent shootings, seldom if ever brought home to the perpetrators, and since they concern only the Sicilians themselves, have not, as yet driven Chicagoans, in self-defence, to purify or abolish this neighbourhood. Not far from here, in the shooting of Weiss, the head of the north-side beer gangs, who deposed Dean O'Banion, the best-known figure in Chicago gangland life, culminated the long series of beer wars between rival gangs, which once threatened to reduce law and order to a farce [12].

Hard by to east is Little Europe, a cosmopolitan district peopled by mixed nationalities of eastern European, Jewish, German, and Scandinavian origin who find employment in the city.

South of the Loop, at the intersection of 22nd Street and Wabash, is the centre of the Chicago 'Underworld' [11], the

headquarters of some of the worst criminals in the United States. Nearby are night clubs and cabarets, including that run by Al Capone. Not far off is the hotel in which he lived. The district, conveniently placed with reference to the Loop, forms a centre for a certain aspect of Chicago night life, and is visited by many Chicago notables. Close by is Chinatown, the scene of the 'tong' wars, now happily a thing of the past. The Chinese here, as in other centres in America, are extremely useful members of society, devoting their energies to the running of laundries and eating-houses, essential units of the cultural landscape of modern civilisation.

Around the remaining manufacturing districts to south are many other national groups. Of these we have already referred to two—the Polish group at the Illinois Steel Company's plant and the well-known 'Back-o'-the-Yards' area close by the Union Stockyards. Between this latter manufacturing zone and the coast, but not quite reaching the coast, are two other distinctive groups, that of the better-class Jewish residential area to the south, and the long wedge of the Black Belt which extends southwards from the 'Underworld' as far as 63rd Street [13]. This latter area, the chief home of the coloured population of Chicago, is adjacent to the coastal residential district. The coloured people make excellent servants, deft and unobtrusive, and in private houses, hotels, and on the railways do much of the domestic work. They live, mostly, in appalling ramshackle apartment houses, but are slowly spreading into areas of declining better-class neighbourhoods, ousting the Jews from parts of the Hyde Park area immediately to north of the University Community, in which there is much demand for them as servants.

In our broad outline of the residential areas we have so far been concerned mainly with the regions in which are the manual labouring classes who do the bulk of the city's heavy work. Two main zones of residential property we have so far left untouched. They are on the immediate lake front and the outlying residential suburbs.

On old islands of gravel or limestone, rising above the

general floor level of the old lake bed, and on the bluffs beyond to south-west and north, are modern suburban groups, such as Blue Island, Chicago Heights, Chicago Ridge, Riverside, and others, taking advantage of the pleasanter surroundings and drier subsoil, found under such conditions [14]. In these centres live business executives and others who can afford to pay the higher rents demanded, and the cost of transportation to the centre of the city. All these areas are linked with the centre by fast motor and rail traffic. Stretching out to meet this zone directly west of the poorer districts back of the Loop, is an area mainly occupied by typical Americans. To north-west a similar belt stretches out, mainly occupied by people of German origin, in part, no doubt, related to the distinctively German settlement of the dairy and cheese regions of Wisconsin beyond.

To south of the Loop lies the old 'Gold Coast' on the lake front, the home of the wealthy people of Chicago in the early days of the city's growth, a region to-day rapidly decaying but still the home on Prairie Avenue of people whose names are outstanding in the history of the city. The fine old mansions are still standing and are being converted to other uses, as the occupants have largely moved to the north side and the neighbourhood is too close to the Chicago 'Underworld,' growing at its expense.

Far south of here, beginning at 50th Street, is the south side 'Hotel Coast.' Beginning with the Chicago Beach Hotel and a tall new skyscraper apartment block of some thirty stories, it runs south along South Shore Drive, flanked by great hotels such as the Cooper-Carlton, and immense blocks of high-grade apartments and country clubs almost to the northern limits of the Illinois Steel Company's plant at 79th Street. Here we have one of the best residential districts in Chicago, with broad, spacious, tree-lined avenues facing the lake, linked to the centre of the city by the Illinois Central tracks and by fast bus routes, and possessing every facility for comfort and convenience.

As a residential district the southern 'Hotel Coast' is only

surpassed by the modern 'Gold Coast' and 'Hotel Coast' north of the city. The latter begins at Streeterville, north of the Loop, on the lake front facing Lake Shore Drive, with a section devoted to hotels, clubs, and apartment houses. A line of magnificent private residences and palatial hotels form the homes of the élite of the city and of notable visitors. Broken by parks and open spaces, this zone continues north by the lake through Evanston, with the magnificent buildings of the North-western University Campus, Wilmette, Highland Park, Ravinia, with its open-air opera, and Lake Forest, to the United States Naval Training Station at North Chicago, some forty miles from the Loop. In the latter part of this stretch of residential country, the lake shore rises in bluffs, varied by steep ravines running down to the lake—a well-wooded zone, in which are many delightful homes set in spacious grounds. To this haven of rest, with its attractive natural surroundings, the richer business men and executives of Chicago's great industries, retire daily after their labours in the city. It is backed near the city by the Uptown 'Bright Light Area,' a centre for shopping and amusement which competes with the Loop, and by a Swedish area from which the higher grade of Chicago servants is drawn.

From a sketch of the cultural landscape of the city, we cannot omit a brief reference to 'Towertown,' the Bohemia of the city and the centre of its artistic life. Located at the back of the south end of the 'Gold Coast,' it is the home of artists, art clubs, and studios, of Julien's Restaurant, the Studio Players, and many cabarets and night clubs—all expressions of the desire of the city to manifest itself in artistic ways. The true focus of this expression, however, is to be found not here, but in the Art Institute east of the Loop, on the lake front, which has attached to it the largest school of art in the United States, with over 4,000 students. The Institute houses an admirable collection of sculpture and paintings both ancient and modern.

As an expression of, and typifying, the cultural life of the city we may glance at the many buildings of the University of

Chicago, standing on 100 acres of land, some seven miles south of the Loop, backing the 'Hotel Coast.' Between its campus and the lake, is beautiful Jackson Park. Nearby, on Woodlawn and adjacent avenues, are the homes of the faculty and the fraternity houses and halls of the students, who to-day number over 11,000. The most striking unit of the group of over forty buildings on the campus is the University Chapel, the last gift to the University of John D. Rockefeller, who contributed at various times sums amounting to nearly £7,000,000, or almost three-quarters of the total assets. The architecture is an adaptation of English Collegiate Gothic, which gives, together with the creepers on the face of the stonework, a remarkable air of dignity, age, and quiet repose almost unbelievable in a group of buildings so very young. The site, the sandy shore of the old lake bed, lying beyond the city limits when donated for the purpose by the Hon. Stephen A. Douglas, has presented many problems to the builders. Some of the earlier buildings have required subsequent work on the foundations to prevent cracking, a difficulty overcome to-day in the way already described elsewhere.

In the University schools a remarkably high level of academic work is reached, particularly in the post-graduate school, in which it ranks among the best in the world. It thus forms a fitting crown to the intellectual life of the city, by providing an institution in which the acquisition of knowledge through research, and the dissemination of knowledge through teaching and publication of the results of such research, go hand in hand. This latter aspect of its work is fittingly typified in the University of Chicago Press building at the western end of the campus.

Closely related in some ways to the work of the University is the Field Museum of Natural History. Standing in Grant Park, east of the Loop, by the lake, this magnificent building is a unit of the cultural landscape of the city rooted in the work of its merchant princes, for it was founded by a gift of $1,000,000 from Marshall Field and subscribed to by many others of those whose fortunes were made in Chicago. The

building is modelled after a Greek temple. It occupies 11 acres and has four main departments devoted to anthropology, geology, botany, and zoology, but concerns itself with many other aspects of science, and finances expeditions to various parts of the world to add to the sum of human knowledge of strange lands and to extend its collections. Here the native Chicagoan, and others interested, sees life-sized settings of the activities of the animal life, vegetation, and rock structure, of his own and other lands. He sees something of the conditions in which people live in very different natural surroundings from those with which he is familiar—an experience which, quite apart from the facilities provided at the museum for scientific study, cannot fail to broaden the mind and enliven the sympathies towards peoples of different lands: an important consideration to a population so busy with its own affairs as to have little leisure to think of others.

Every great city may be conveniently regarded as a functioning organism, the individual units of activity in which contribute to the well-being of the whole, but the massing together of some three millions of people in a comparatively small area gives rise to many problems the solution of which cannot be undertaken by individuals, but must be delegated to community organisations working for the general benefit. Such problems concern street cleaning, the public health, water supply, sewerage, the provision of public parks and recreational areas, and the maintenance of law and order, to mention but a few of the manifold public needs arising under modern civic conditions. The performance of such services for the general good is intimately related to the natural environment of the region, necessitating the taking of natural products, and the adaptation of natural conditions to the fulfilment of them.

Among the units of the cultural landscape resulting from these activities perhaps chief place should be given to the Federal Building occupying an entire block on Jackson Boulevard, where are housed all departments of the national government, including the main post office, occupying the whole of

the vast ground floor and the basement. Nearby is the city and county building, containing all departments of the city and county governments, responsible for the civic welfare of a population larger than that of the whole of Ireland. Not far off is the Criminal Court Building, the focal point of Chicago's efforts to wipe out gang rule and the source from which is derived much material for plays and stories of the more lurid aspects of Chicago life.

Returning to our viewpoint on the Tribune Tower overlooking the main branch of the river, we see, from two to four miles out in the lake, a series of nine wooden erections, the 'cribs,' or pumping stations, from which, through pipes laid on the lake bed, nearly 1,000 million gallons of water are drawn daily, and distributed by over 3,000 miles of piping to supply the city's water needs. Situated close to the water-parting between the Great Lakes and the Mississippi system, Chicago has no high ground near from which to draw the water needed for her domestic needs, her vast industries, and her railroad plants, but fortunately nature has provided water without stint in the great lake at her front door.

Dropping our gaze to the river at our feet, close observation tells us that the water flows, not into Lake Michigan—as we would expect from the fact that the early French voyagers paddled their canoes against its current up to the water-parting between it and the Desplaines River, and thence to the Mississippi—but moves westward from the lake, reversing the original current in the main and south branches of the Chicago River. It continues south-westward in the Drainage Canal to the Desplaines River and thence to the Illinois by way of the Chicago Outlet [14]. The latter is a broad, flat-bottomed, steep-sided valley from ½ to 1½ miles wide, the gift of the ancient glaciers to the solution of the city's sewerage and transportation problem. The highest point on its floor being only some 15 feet above the level of Lake Michigan, the Drainage Canal, begun in 1892 and completed eight years later to carry off the Chicago sewage formerly allowed to pollute the lake, was excavated with relative ease when the

colossal character of the work involved over its 36 miles of length is appreciated. To-day such portion of the city's sewage as does not reach the incinerators, is carried off to the Illinois system, and is rapidly purified by the 14,000 cubic feet of water per second flowing from the lake. The proposal to convert the canal into a deep waterway linking the lakes to the Mississippi has, however, aroused much controversy and legal dispute, for it is claimed that the volume of water which would thus be drawn off from Lake Michigan would, by lowering the general level, seriously interfere with the navigation of the lakes and the water rights of the many other cities and settlements on the shores of the lakes, not to mention the possible damage to Niagara Falls, both scenically and from the standpoint of the development of hydro-electric power. This raises what would be an international and not merely a national problem. The details of this problem are highly complex and beyond our scope to discuss here. It is contended that the level of the lakes fluctuates in response to great natural causes, such as the volume and time of melting of the winter snowfall, and that the amount drawn off by the lake cities and to be drawn off by the proposed waterway is quite negligible as compared with the total available supply of the Great Lakes system.

At Lockport, on the waterway, 30 miles from the city, is the control point of the system, and a hydro-electric plant which supplies the city with electrical energy. In the depression are also a barge canal, two of the main railways entering the city from the south-west, and a great trunk road. The water-parting, separating the Great Lakes here from the Illinois and Mississippi system, is a massive moraine rising a hundred feet above the bottom of the trench. It sweeps in a semicircle round the district of Chicago, cutting it off from the south-west. But, as we have noted, the glaciers, though building the barrier, at a later stage conveniently cut the passageway through it which we are now examining, and provided an easy line of movement for the ceaseless stream of humanity which is at present to be found in it, and for the

still greater volume of men and goods which there is little doubt that the future is destined to see. The elements of the cultural landscape in this great depression are thus the expression of a threefold aspect of man's adaptation of nature in providing a great system of highways to the south-west, in disposing of the city's surplus sewage, and in generating current for municipal and private uses.

From the summit of the Tribune Tower we may make a preliminary study of another aspect of the city's communal activities. To the south of us on one side of Michigan Boulevard is the massive range of skyscrapers facing the lake

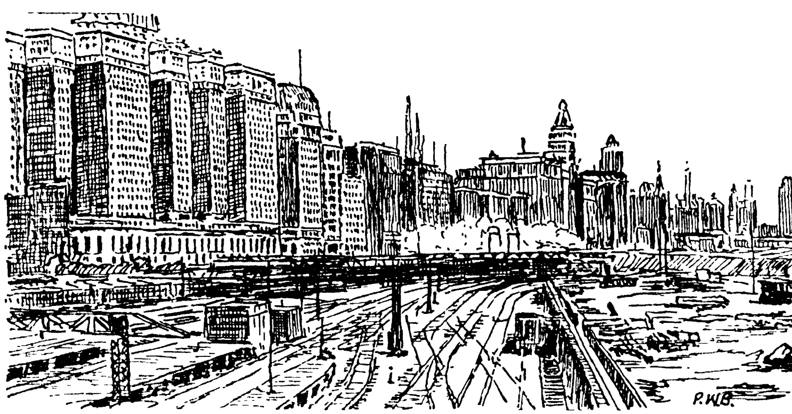


FIG. 56.—VIEW OF ILLINOIS CENTRAL RAILWAY ON CITY FRONT.

front, forming an impressive edge to the great city beyond. At their feet lies the broad thoroughfare, the eastern edge of which, when white people first settled, marked the lake shore. Bounding it to-day, is the maze of tracks owned by the Illinois Central Railroad, for the city fathers, not so farsighted as their successors of to-day, refused it other access to the heart of the city, and compelled it to build in many cases on piles along the lake front, a decision in later years bitterly regretted, but found after many desperate legal battles to be irrevocable (Fig. 56). The heart of the city was thus, over a front of six miles, shut off by this unsightly aspect of the cultural landscape from one of its chief assets. Our view to-day, however, shows, to lakeward of the tracks, a double system of thickly

wooded parklands and driveways, separated by charming lagoons, crossed by ornamental bridges, and set, in the immediate foreground, with such beautiful buildings as the Field Museum, the great Amphitheatre, and the Shedd Aquarium.

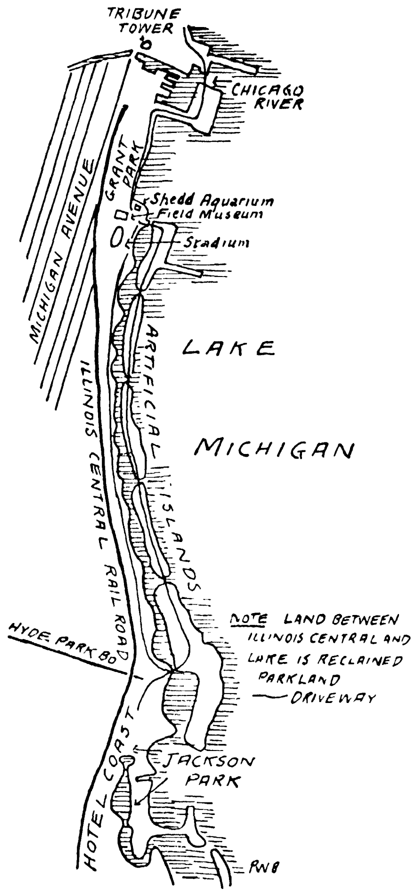


FIG. 57.—SKETCH-PLAN OF PARKWAYS, CHICAGO.

This is continued southward in the wooded islands and lagoons of Jackson Park. Northward we see its extension in Lincoln Park along the front of the 'Gold Coast.' The waterway separating the parks to south of us is some 5 miles long and 600 feet wide, and the total area covered by parks in the city is about 5,000 acres (Fig. 57). Along the outer edge of the park system by the lake side there is now a magnificent motor driveway some 40 miles in length. On a run along this driveway we note the many recreational units, such as golf courses, tennis courts, bowling greens, gymnasiums, baseball pitches, and playgrounds, available for the citizens. Outstanding among these facilities are the bathing beaches, to which in summer-time the hot and tired thousands of the city's workers troop from the congested, stuffy slums already noted. Few contrasts are more striking than that of the poor of the stifling tenements in Little Europe passing the magnificent houses at the southern end of the 'Gold Coast' on a sultry July Sunday to revel in the relatively cool lake waters of the Oakfield Bathing

Beach. These beaches are an important health asset to the city in a climate in which shade temperature of summer days may run over 90° F., with a relative humidity figure of the same order, modified, however, to a degree not possible in other mid-western cities, by cool evening breezes from the great expanse of water. Owing to the numbers involved, it is sometimes held that this bathing on the more congested beaches spreads certain milder ailments. The lake waters, with certain winds in the vicinity of the city, lack adequate circulation, the conditions then being not as salubrious as might be wished.

Other remarkable elements of the lake front parkway system are the great viaducts, ferro-concrete structures, which link the parkways to the main boulevards across the Illinois tracks and over the intervening lagoons. In places these provide 86-ft. roadways. Their construction under the severe winter conditions of the district and the inadequate foundation available, was carried out by working the concrete mixtures with steam jets at a temperature of 100 degrees, and by using cylindrical concrete caissons carrying down to bedrock 80 feet below the surface. Thus man's inventive genius overthrew nature's opposition while utilising her materials in the process.

One other striking element of the cultural landscape of the parkways may perhaps be referred to here. In Grant Park, opposite the Loop, stands what is perhaps one of Chicago's greatest prides and in some ways its most distinctive artistic achievement—the Buckingham Fountain. The fountain is in the form of four circular basins stepping up to a height of 25 feet, the outer one of which is 300 feet across. The lines are flowing and beautiful, suggesting water. In it are four sculptured sea-horse groups in bronze, from whose mouths graceful jets of water are discharged. In the heart of the fountain is one great central jet, and artistically arranged around it are 133 other jets, the central jet in full play rising to about 110 feet, beautifully balanced by the lesser curving jets around. Concealed within the structure is an elaborate system of indirect lighting. To see it circulating its 3½ million

gallons of lake water, illumined by 30 million candle-power, on a summer's evening, in the early dark of the Chicago region, is to see an artistic expression of the cultural landscape of the city which remains as an unforgettable picture in the mind.

How comes all this system of parkways, amenities, and beautiful structures where twelve years ago, over much of the area, the lake waters held full sway? Born in the fertile brain of Daniel Hudson Burnham, a Chicago architect, who planned the Chicago Exposition of 1893, the World's Fair; developed by the Commercial Club of the city; carried out by the South Parks Commissioners, an unpaid body of public-spirited business men; financed by taxes on the rateable property within the zone — the Plan of Chicago, as it has been termed, has wrought this marvellous change in that short space of time. Its main object has been to open, to every citizen and visitor, the shore of Lake Michigan, and provide facilities for health and pleasure.

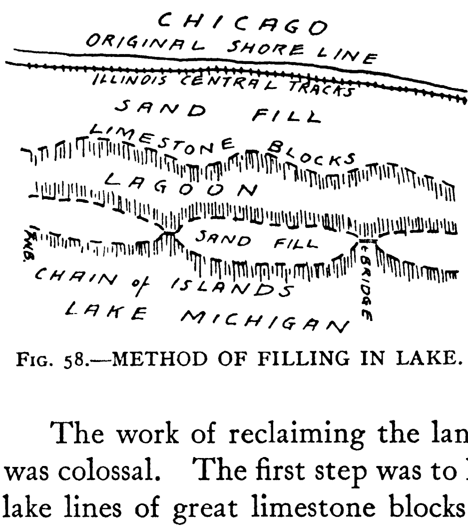


FIG. 58.—METHOD OF FILLING IN LAKE.

The work of reclaiming the land beneath the lake waters was colossal. The first step was to lay down on the bed of the lake lines of great limestone blocks brought by steamer from across the lake to form the outline of the park and island areas (Fig. 58). Next, the areas within had to be filled in to raise them above lake-level. This was done partly by filling in with waste material from the city, but mainly with sand pumped from the bed of the lake. Wooden platforms were erected far out in the lake on which pumping plant was installed. These platforms were connected with the growing land areas by enormous iron pipes through which a mixture of sand and water was pumped to shore (Plate 17). The

accumulating water was drained off, leaving the sand behind. Under this treatment, with simultaneous operations at several points, the land areas grew rapidly. Soon suitable areas of sand on the lake bed in the vicinity were exhausted. Steamers were then sent across the lake to quarry the sand dunes to pay tribute to Chicago's growing amenities. These steamers came alongside the limestone blocks, pipes were lowered into their holds, and the pumping operations began again. One of these boats specially built for the work, carried a cargo of 3,000 tons of sand from Michigan and discharged it at the rate of 1,500 tons an hour. Sandhills of considerable height were built to vary the landscape of the parks by this means, and an ingenious contrivance of dykes and sluices, without the material being washed away to a dead-level by the streams of water from the pipes.

The sandfill having reached satisfactory heights, then came the problem of covering with earth, sowing grass seed, planting trees, and erecting on the site the beautiful structures which now adorn it opposite the Loop. Black earth from the prairies to west was brought in carloads, seeds were planted, trees were lifted with large balls of earth around their roots, foundations were sunk where needed to bedrock, and on the sites where once was 14 to 20 feet of lake water over a mud floor, soon rose the parks and broad motor roads, the trees and grass and flowers, the boathouses and playing-fields, the bathing beaches and splendid buildings which form a fitting crown to man's efforts to adapt a difficult natural environment to satisfy his natural craving for recreation and æsthetic pleasure in the Chicago region. The cultural landscape we have just examined is the adequate expression of this relationship (Plate 18 and Fig. 59).

The cultural landscape of Chicago is the expression of the relationship of a vast organism, consisting of the activities of the people of the city, in their efforts to satisfy their own needs and that of the vast hinterland which they serve, in relation to the natural environment in which, and in connection with which the city has developed. Though to some

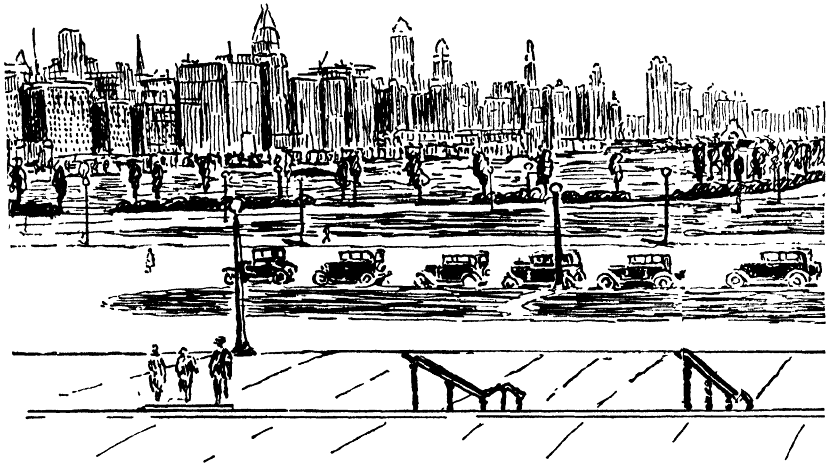
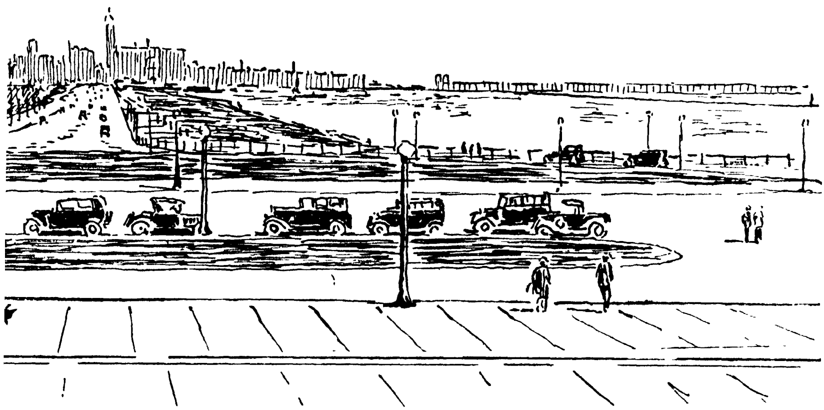


FIG. 59.—GRANT PARK AND CITY FRONT

extent opposed by nature, she has for the most part been kind. Within her hinterland are transportation facilities, resources in livestock, maize, wheat, iron, coal, and timber, to mention but a few, unrivalled, probably, in any other hinterland on earth. With wheat and meat as staple foodstuffs, with coal and iron as the basis of machine construction and transportation, with timber and limestone, in the form of concrete, as essentials in constructional work, all available in relatively unlimited quantities, located in a great oval around the focal point by the lake, Chicago possesses without reference to other areas beyond her sphere, the essentials of our modern civilisation. Couple to this the initiative, the energy, and the backbone of the western pioneering spirit, still here in evidence, and we have the meaning of the city.

The city has been described by one writer as an ingenious jungle of steel and stone, but such description falls far short of the facts, and misses the spirit behind. Her cultural landscape is unique; her story is epic. In it is much of beauty and culture, grandeur and vision; in it is much of dirt and squalor, vice and ignorance; in it is much of graft and corruption, municipal extravagance and private virtue. Yet through it all, Chicago looks ahead and builds for the future



[P W. B.

FROM STEPS OF FIELD MUSEUM.

to be. Of her Sandburg has written in his poem " The Windy City ":

" Put the city up ; tear the city down ; put it up again ; let us find a city.
Let us remember the little violet-eyed man who gave all, praying,
' Dig and dream, dream and hammer, till your city comes.' "

Of her, in 1682, the French explorer, La Salle, prophesied, if the legend be true : " This will be the gate of Empire, this the seat of Commerce. The typical man who will grow up here must be an enterprising man. Each day as he rises he will exclaim, ' I act, I move, I push,' and there will be spread before him a boundless horizon, an illimitable field of activity. A limitless expanse of plain is here—to the east water and all other points land. If I were to give this place a name I would derive it from the nature of the man who will occupy this place—*ago*, I act ; *circum*, all round ; Circago."

Whether truth or fiction, the man depicted here, and the cultural landscape he has built, may well symbolise the city by the lake, and should the day ever dawn that the Great Lakes pass from being an inland Mediterranean to become a waterway navigable for large ocean-going vessels, then no city upon earth will possess the geographical advantages, or build the

cultural landscape resulting from man's utilisation of them such as will be found here at the head of Michigan on the edge of the American Heartland.

Although this brief interpretation of the cultural landscape of Chicago is based, in the main, on personal investigations made by the writer during three summers spent in the city, it has obviously many lacunæ in detail. It is put forward as a brief summary of some of the outstanding aspects of that landscape, and as some indication of what the cultural landscape of a great city stands for in relation to its physical setting.

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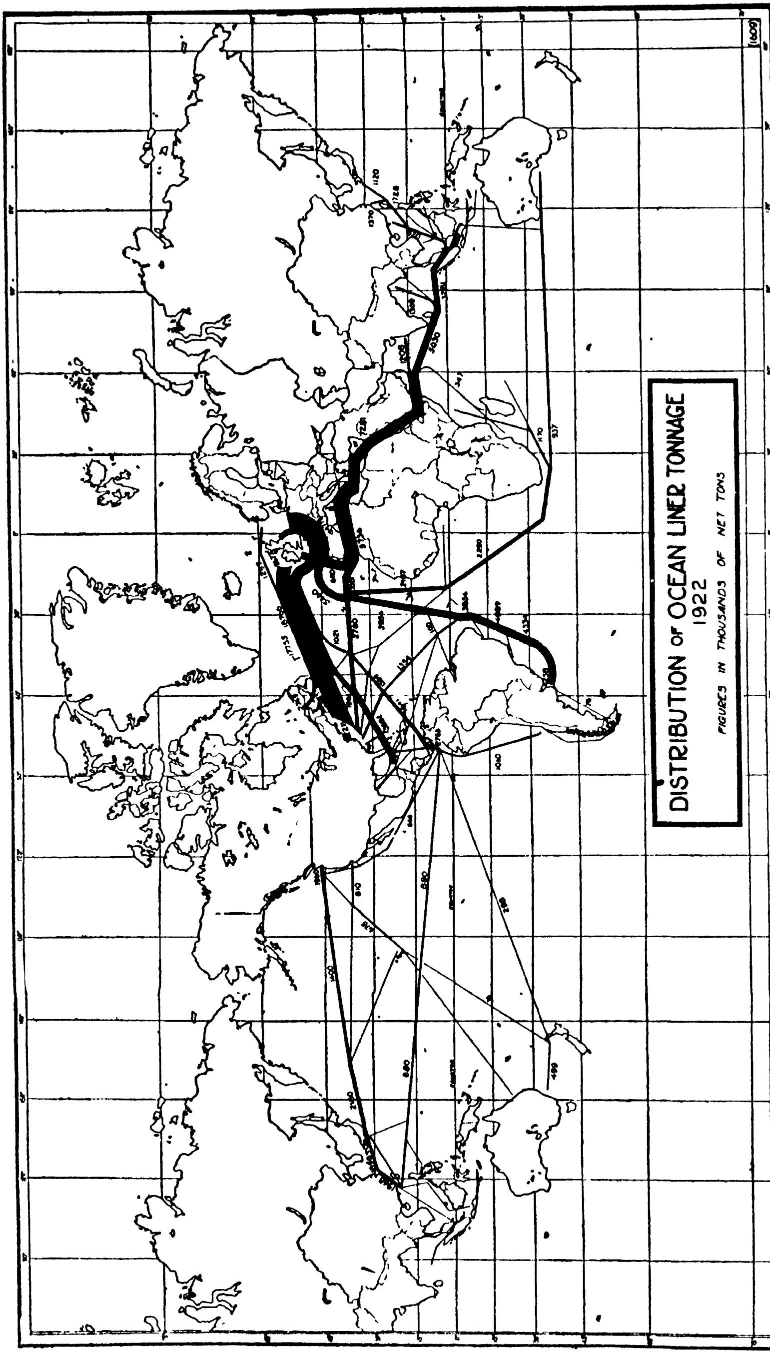
Chapter 12

THE CULTURAL LANDSCAPE OF THE GREAT LAKES—ST. LAWRENCE WATERWAY

The cultural landscape produced by man's adaptation of nature in the effort to satisfy the desire for transport. The Great Lakes and the proposed St. Lawrence deep waterway in relation to natural obstacles.

In the last chapter we referred to Chicago's vision of the future, of a time when a deep waterway navigable by ocean-going vessels will link her with the North Atlantic, where to-day is found the greatest ocean traffic concentration in the world, linking the two great world centres of manufacturing activity in eastern North America and north-western Europe (Fig. 60). As a great world centre Chicago has one principal defect. It is the 1,240 miles of water which separate her from the head of tidewater at Montreal. From that point to Belleisle Strait, there is to-day over 1,000 miles of sheltered waterway available for the largest ocean-going vessels to the open Atlantic. Although at her doors she has a magnificent inland Mediterranean, the average ocean-going vessel drawing from 20 to 25 feet is shut out from navigating these inland waters by natural obstacles. Chicago, as we have seen, is by no means content to remain the capital and nodal point of one of the greatest economic entities which has as yet developed, but pictures a day when she may become the world's greatest seaport. Her visions have a habit of coming true. Should this one do so she will be in a position to ship her products not 900 miles by rail to tidewater, but over 1,000 miles by water, with all that that implies through lowered costs of transport, in making her an effective competitor in world trade. Even to-day the total traffic on the lakes is something hardly credible, though the bulk is not from or to



[Courtesy, U.S.A. Dept. of Commerce.

FIG. 60.—DISTRIBUTION OF OCEAN LINER TONNAGE.

Chicago. The Soo Canals and the Detroit River alone handle over 100 million tons of bulk cargo, more than fivefold that passing through the Suez Canal, carrying the trade between east and west.

We may well begin our study of the cultural landscape of transport, the key to this problem, by an examination of the steps already taken to overcome the natural obstacles preventing ocean-going vessels from navigating the lakes, and the proposals made for a more complete conquest of them in the future. This can be done in the first instance most effectively by a personal trip down the Great Lakes and the St. Lawrence to Montreal, the head of navigation, and across the Atlantic to Liverpool. In this way we come into personal contact with the elements of the problem in the form of the present cultural landscape, and the natural obstacles which have produced it, and which limit at present its further development.

Leaving the Municipal Pier at Chicago in a well-appointed oil-burning steamer, we spend a day in cruising up Lake Michigan and on the morning of the second day we are amid the island paradise of Georgian Bay (Fig. 61). Rocky and pine covered, these islands are a delight to the eye, and are one of the great summer playgrounds of Canada. On the third day we enter the St. Clair River, and pass the jetties constructed to give, by concentrating the current, a deep-water channel through the shallow delta built by the river as it empties into Lake St. Clair. Here was the first obstruction to lake navigation, now deepened to 22 feet. A little later we enter the Detroit River, which drains Lake St. Clair into Erie. We pass through the deep channel cut here in the limestone bar in the bed of the river to provide a depth of 22 feet, and come alongside the great wharves of Detroit, the automobile city, equipped with massive handling apparatus for dealing with cargo from the upper lakes. We see many steamers heavily laden with iron ore and grain from Lake Superior, and had we started our trip with them, we would have passed through the elaborate canal constructions rendered necessary by the highest obstruction in the upper lakes to free naviga-

tion—the rapids of the St. Mary's River, draining Superior into Huron. Here there are four canals, two for navigation and two for power. They have a depth of 24 feet. Though there is one of each in U.S.A. and Canadian territory, steamers use whichever canal happens to be free irrespective of nationality.

On the fourth day we tie up at the great terminals of Buffalo, with its massive equipment for handling grain and

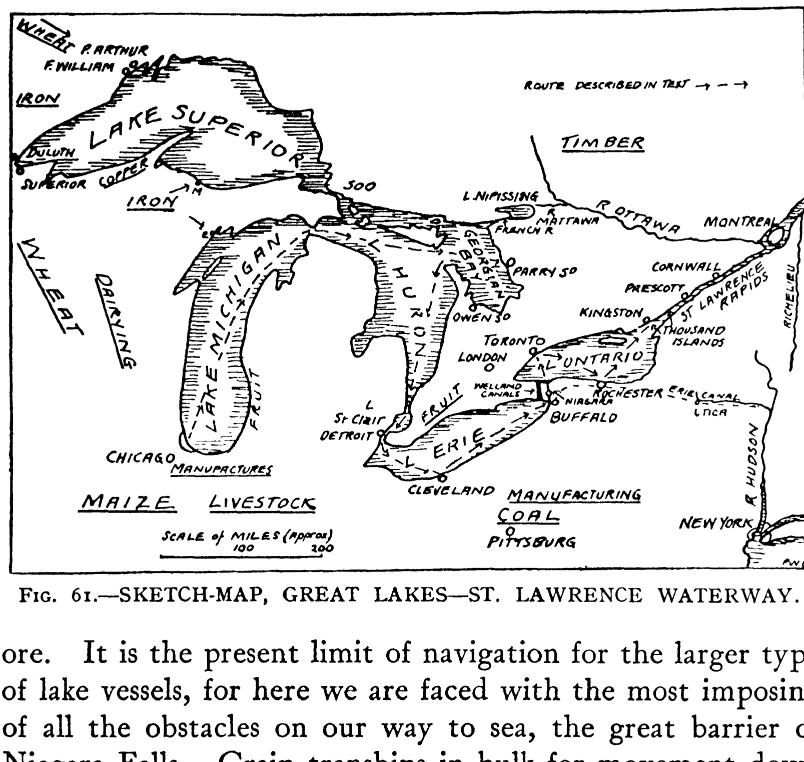


FIG. 61.—SKETCH-MAP, GREAT LAKES—ST. LAWRENCE WATERWAY.

ore. It is the present limit of navigation for the larger type of lake vessels, for here we are faced with the most imposing of all the obstacles on our way to sea, the great barrier of Niagara Falls. Grain tranships in bulk for movement down the Hudson-Mohawk Gap to New York and Boston. Mighty elevators, giant cranes, and steel grabs line the harbour, backed by warehouses. The docks are full of shipping—mostly the long, low, typical lake boats, with their many hatches to facilitate rapid handling of the products carried. All are aspects of the cultural landscape produced by man in adapting nature to his need for transport.

Buffalo opposes Chicago's plans for a deep waterway to the sea on two main grounds. She is at present the foot of lake navigation for the larger type of lake boat, and fears a loss of income resulting from her position as the chief break-of-bulk point on the way to the coast for American products. She also fears, as do many other lake centres, that Chicago's development of a waterway to the Mississippi will produce a lowering of the available volume of water in the lower lake ports and thus reduce the level in the present channels and harbours and alongside the wharves. Plans are now in hand for the deepening of the Soo, St. Clair, and Detroit channels to 27 feet, to take boats of 25-ft. draught. Any lowering of the level of the lakes would greatly increase the cost of these schemes. A heavy capital loss is also feared in respect of the funds now invested in equipment at Buffalo, part of which might become derelict if bulk grain could go right through to the coast. Similar objections could be raised on behalf of the Georgian Bay ports and their elaborate equipment for handling grain at the transhipment points at Owen Sound, Parry Sound, and Depôt Harbour, where grain breaks bulk for Montreal. It is possible then that we are looking here at aspects of a cultural landscape which may be very ephemeral, though any such changes, in view of the great congestion of traffic and the time necessary to complete the deep waterway scheme, are likely to be long delayed.

Niagara, where the overflow from Lake Erie drops 150 feet over the Niagara limestone escarpment on its way to Lake Ontario, is one of the two major obstacles to be overcome in any deep waterway scheme. To west of it is the Welland Canal built by the Canadian Government to avoid the obstacle. This canal, from Port Colborne on Lake Erie, where the large lake boats tranship such goods as go farther by water, to Dalhousie on Lake Ontario, is 14 feet deep and has twenty-six locks in its length of 26 miles. Nearby, from Port Weller to Dalhousie, is the new Welland Ship Canal, of seven locks, with a minimum depth of 27 feet, and provision for deepening to 30 feet. It thus does away with the transhipment problem at

Port Colborne caused by the Niagara escarpment, and can handle the size of vessel which carries on nearly 90 per cent. of the foreign commerce of the United States.

The nature of the obstacle and the problems involved can best be appreciated by an inspection of the Falls and the gorge below. From a low hill on the west or Canadian side we see the river, on its way down from Erie, break into rapids, which as they approach the brink, are split by Goat Island. It then plunges in two great cataracts, the American Fall to east and the Canadian or Horseshoe Fall to west, 160 feet into the gorge below. A vast plume of mist rises above the level of the crest, for the pool below the Falls is 250 feet deep, and into it plunges the river over a width of nearly three-quarters of a mile (Plate 19). To windward of the Falls the countryside is drenched in spray, and the ear is deafened with the thunderous roar from which their picturesque Indian name is derived. To get a full sense of the volume and roar of this great cataract one must see it and hear it from below, in the 'Cave of the Winds,' or on the 'Maid of the Mist.'

There are those who are disappointed in Niagara. Its width takes from its height. But one's sight needs supplementing by one's feelings and mind to appreciate it to the full. It is difficult to realise how one can be disappointed standing beneath it, stunned almost by its roar, the immensity of its volume, and the irretrievableness of its catastrophic plunge. As Rupert Brooke has put it, "The real secret of the beauty and terror of the Falls is not their height or width, but the feeling of colossal power, and of unintelligible disaster caused by the plunge of that vast body of water. . . . On the edge of disaster the river seems to gather herself, to pause, to lift a noble head in ruin, and then with a slow grandeur, to plunge into the eternal thunder and white chaos below."

Man does not permit this colossal power to run to waste. Right and left of the Falls in the gorge below are great power stations (Plate 19), the expression of man's adaptation of this power for the production of nearly 2 million horse-power of

hydro-electric energy, which on a conservative conversion basis is the equivalent of over 20 million tons of coal per annum, or nearly the total coal production of Belgium. With this power the surrounding countryside is served, and even far-off Toronto, across the lake, draws her supplies of electrical energy from Niagara. Niagara represents the water-power ideal—a vast natural reservoir, and an abrupt, high drop. It forms the greatest single hydro-electrical unit in the world. On it are based many local manufacturing industries. Electric furnaces at Niagara handle rare earths and ores; carbon electrodes, carborundum, and other products are made to find their chief market in the adjacent steel centres of Cleveland and Pittsburg.

The scenic value of the Falls is difficult to estimate, but it supports the large tourist industry of the twin cities of Niagara Falls on each side of the international frontier.

The Niagara gorge is a serious obstacle not only to movement down from Lake Erie, but to movement across the gorge itself, and this obstacle has produced the four great steel bridges, two for road and one for rail transport, which span it. Had we come from Chicago here by rail we would have crossed the upper railway bridge, and had a magnificent view of the rapids below. These rapids end in the great whirlpool above which we can pass on a light steel car suspended from cables across the big loop in the left-hand side of the gorge—a loop which probably marks the site of an ancient fall, for the present Falls have been produced by the cutting back or recession of the falls which once began at Lewiston, at the foot of the Niagara escarpment seven miles to north. From the car we get an excellent view of the railroad which is cut into the foot of the steep side of the gorge just above water-level, and links Niagara Falls with Lewiston.

Returning to the Falls and crossing the international road bridge, we board the cars and take train for Lewiston to continue our water trip down the lakes and the St. Lawrence (Plate 20). At Lewiston we look back and see the steep edge of the escarpment some 200 feet high, with, nearby in the

gorge, a new power station which is fed by canal from the river above the Falls (Plate 20).

Although a barrier to navigation, Niagara provides ample compensation measured in terms of beauty and power. Here nature forces man to make elaborate and costly structures to overcome her opposition and bend her to his will, largely conditioning the way in which he does so and the materials he employs. The results in the form of canals and power stations, bridges and terminals, are striking units of the cultural landscape of transport and hydro-electrical energy.

At Lewiston we board the lake steamer. Long, narrow, tall, sharp-prowed craft they are, with many decks one above the other, giving a curious terrace-like appearance, which, to the eyes of an ocean seaman suggests instability, especially with the load they take on board. They are, however, admirably suited to the passenger and light cargo traffic which they carry around Ontario. From the upper deck we soon get a distant glimpse of Toronto—an artificial harbour developed at a point which commands the easiest and shortest route between Georgian Bay and Lake Ontario, selected as such as a compromise between Kingston on the east and London on the west as the capital of the province. It has thus become the centre of the commercial and intellectual life of the province of Ontario.

As we approach we see the dredgers busily at work at the mouth of the harbour defeating nature's efforts to silt it up. Entering we come alongside one of the many fine piers which handle her traffic and see something of the elaborate constructional work going forward to fit her, even more than at present, to partake in the future traffic of the lakes when the deep waterway plans mature. Back of her are magnificent fruit and agricultural lands which will greatly benefit as a result of direct contact with the sea, hence her farsighted citizens are spending much money in the equipment of new terminal facilities to enable her to make full use of her position. Around Ontario are other ports, including Rochester and Kingston, each of which stands to benefit by direct contact with the ocean.

At Toronto we again change boats to take us eastward along Ontario to Prescott at the head of the St. Lawrence Rapids (Fig. 62). Leaving Ontario, we enter the island-studded strip of waterway known as the Thousand Islands. Actually there are about 1,600 rocky, wooded islands in the 40-mile stretch of water where the St. Lawrence, on leaving Lake Ontario, cuts across a corner of the Laurentian Shield, which projects far southward into United States' territory. This stretch of the river resembles Loch Lomond if one can picture the latter many times magnified and deprived of its encircling mountains.

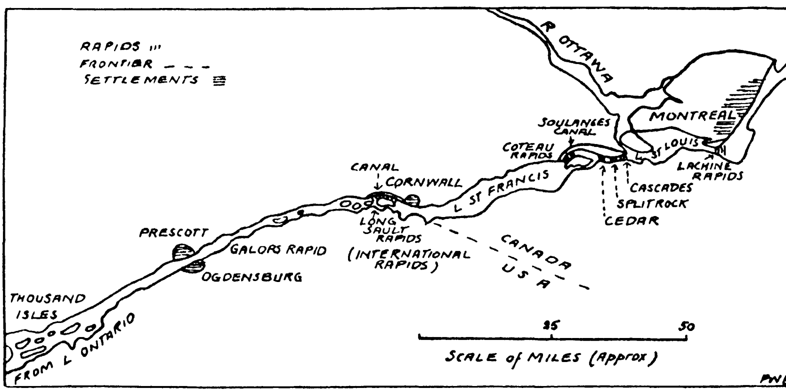


FIG. 62.—SKETCH-MAP, ST. LAWRENCE RAPIDS.

A well-marked, deep-water channel winds in and out between the islands, many of which have charming bungalows, the summer homes of wealthy Canadians and Americans, set on the forested shores by the water's edge (Plate 20). We are in one of the great summer playgrounds of North America, and the buildings we see are part of man's adaptation of nature in the effort to satisfy the demand for recreational facilities.

We reach, at the end of this charming stretch of water, the head of the International Rapids at Prescott, where we again change into one of the small rapids steamers to make actual contact with the second great obstacle in the way of the development of the deep waterway scheme, and incidentally to enjoy the thrill of shooting, in a modern steamboat, the rapids which the Indians shot in birch-bark canoes.

Between Prescott and Montreal, over a distance of 100 miles, the river drops 220 feet from the level of Lake Ontario to tidewater at Montreal. The greater part of this drop takes place at three points where there are groups of rapids, the latter of which, the Lachine, approaches in character to a fall. Between the groups of rapids are two long lake-like expansions on its course—Lake St. Francis and Lake St. Louis (Fig. 62). These three main groups are the International or Long Sault group with a drop of 92 feet in 49 miles, the Soulanges group, consisting of the Coteau, the Cedars, the Split Rock, and the Cascades, where the river falls 83 feet in 18 miles, and lastly the famous Lachine which drops 48 feet in 23 miles. Actually the major portion of each drop takes place in much shorter distances than those given.

Shortly after leaving Prescott we enter the first rapids, the Galop and the Rapide Plat. We notice little but a speeding up of our vessel, caused by the increased speed of the current, and a certain ominous boiling of the water hinting at the lurking rocks below. A stretch of smoother water follows and then, in the distance, we sight the white caps of the famous Long Sault. A moment later and the river looks like a great barrier of angry foaming water. We are in the midst of it, our vessel gathers speed. The engine is shut off (Plate 21). We move faster and faster, swinging rapidly from side to side. The pilot is dodging the rocks clearly seen on either hand. This for nine miles, at the end of which we glance back at the surging, savage waters through which we have come, and breathe a sigh of relief, and marvel at the skill which has brought us safely through what *looked* like certain destruction to our untrained eyes. Under the nature-trained skill of an Indian chief, the first steamer to come through these rapids was safely brought down in 1844. Since then Canadian pilots have acquired the knack.

Below the rapids we see a large steamer set, as it were, in the land. It is really, as we see when we approach closer, in the lower end of the canal constructed to avoid this obstacle. Each group of rapids is avoided by a canal. As at present, the

depth of these canals is only 14 feet, the size of vessel using them is limited, and the larger type of ocean-going craft is definitely shut out. To overcome this difficulty, the International Joint Commission on the St. Lawrence waterway scheme, proposes that new canals be constructed on the lines of the new Welland Ship Canal with a minimum depth of 27 feet, and that, in part, to offset the cost incurred, dams be thrown across the river at two points, one of which is Cornwall at the foot of the Long Sault, to develop hydro-electrical energy, amounting at a maximum to about 5 million horsepower or the equivalent of some 50 million tons of coal per annum. These canals would permit about eight out of every nine ocean-going cargo vessels—vessels of 4,000 to 8,000 tons —to reach the upper lakes. The power generated at the dams, it is suggested, could be sent across the New England Mountains to the textile- and metal-working districts beyond. Its sale, at an estimate cost of 1 cent per kilowatt hour, would go far to solve the pressing transportation and fuel problems of that region, the commercial development of which is now seriously hampered by the necessity of importing Pennsylvanian and West Virginian coal by long rail and water hauls.

At Cornwall we see the large power-station that at present utilises only a fraction of the power of the Long Sault, and transmits its current by high-tension cable across the river. We stop here for a few minutes to take on cargo and passengers, and, by no means of least importance, a more experienced pilot to take us down the last two groups of rapids, the Soulanges and the Lachine. There are now on the boat four men of long experience and iron nerve, each one of whom is competent to take us the rest of the way to Montreal. The master pilot we have just taken aboard directs and takes over the wheel himself at critical points.

After crossing the lake-like expanse of Lake St. Francis, we shoot, in rapid succession, with many a thrill, the Coteau, the Cedar, the Split Rock, and the Cascades (Plate 22). We glimpse other power-stations and canals, and enter Lake St. Louis. After a placid 12-mile crossing of the lake we see

ahead the famous Lachine, the most difficult and dangerous of all the rapids. Swiftly approaching, we enter clouds of spray and surging, boiling water with many rocks visible above the surface. Many more are just hidden. The channel is narrow and tortuous. We seem to graze the rocky ledges as we swing rapidly from side to side at great speed. Near the end we seem to leap a ledge clearly visible on either hand (Plate 23). We are in the boiling, eddying water below. A few minutes later we pass under the great granite Victoria Bridge, which here spans the river, 1¾ miles wide, above Montreal. Her water front of 16 miles is lined with rank upon rank of massive elevators, symbols of her tidewater position in relation to the great western grain trade, much of which originates 2,000 miles beyond her docks. Coal-discharging equipment, giant loading cranes, cold-storage plants, miles of great warehouses, immense piers, and many ships are, from the waterfront, the main elements and units of the cultural landscape of a terminal which is not only the greatest grain-handling port in the world, but, in America, stands second only to New York in the total of her shipping. It commands three great routes to west, south-west, and south—the Ottawa, the St. Lawrence, and the Richelieu, and one north-east to the ocean—the lower St. Lawrence. To-day, at the head of tidewater, its channel of 30 feet is to be deepened to 35 feet. It is the major break of bulk and contact point between Canada and much of northern U.S.A., and the great traffic concentration of the North Atlantic, 1,000 miles to east beyond Belleisle. We may usefully stop at this point to examine something of the implications of the deep waterway plan.

In connection with a gigantic scheme of this sort there are bound to be many and bitter differences of opinion expressed, not merely with reference to its feasibility, but as to its immediate and ultimate economic benefit to the regions served. Faced with masses of expert authority on both sides and many *ex parte* and political expressions of view, it is difficult to arrive at clear-cut conclusions. The attempt is here made to sum-

marise as judicially as possible both sides of the question. The most reliable material on the subject is in the many reports of governmental and other commissions and authorities, to which consideration of the problem has been referred in both the United States and Canada [1, 2, 3]. Any analysis of the position falls under several heads, the more important of which are those relating to the engineering practicability of the scheme in relation to the natural environment, its preferability to other proposed alternative routes, the possible traffic in relation to present and future needs, the rate saving effected, the effect on existing features of the cultural landscape, and the specific objections put forward against the scheme on this and other grounds.

Though many objections were raised in the early days of the scheme, there is little doubt expressed to-day as to its feasibility from an engineering standpoint. It involves for economical working a clear 27-foot channel from the upper lakes to head of tide at Montreal. Such a depth would care for 90 per cent. of North American cargo vessels. To provide for this depth the Soo Canals and the canalised Detroit and St. Clair Rivers need deepening. The new Welland is over this depth. Thus the only serious obstacle remaining would be the St. Lawrence Rapids. These would be treated in the manner already described. A possible future increase of depth to 30 feet would care for 98 per cent. of the present ocean-going cargo tonnage of North America. The suggested power scheme is equally feasible, and the only doubts expressed on this point are as to the economic disposal of the current.

The two major alternative outlets for a deep waterway to reach the same ocean traffic area are via the Hudson-Mohawk gap and the Georgian Bay route. The former would involve the construction of 185 miles of new waterway, and has been rejected by the United States Government engineers as being inadvisable [3]. The Georgian Bay route would involve heavy expenditure to be wholly borne by Canada, and would not provide the water-power compensation available on the St. Lawrence Rapids route.

From the standpoint of traffic, the major advantages lie in the more economical handling effected in larger bulk units by water, the avoidance of break of bulk points at the coast, and the relief of the present excessive traffic congestion between the lake country and the Atlantic seaboard. To-day, although 2,000-ton ocean-going vessels can and have penetrated the upper lakes, they cannot carry sufficient cargo to reap full advantages from their ability to do so. It is estimated that the present grain rates from upper lake ports, such as Duluth, Fort William, or Chicago, to Montreal could be reduced from their present level of about 17 cents to from between 8 cents to 11 cents. In other words, they could be cut in half with a corresponding benefit to the western farmer in purchasing power and to the consumer in cost. This would stimulate trade in other directions through the additional purchasing power made available, and thus lead to further developments of the cultural landscape of industry. At present the level of rail rates on grain from Chicago is largely governed by the facilities even now available by water. It is thus much lower than the rates which rule where no such competition exists. In the absence of such competition the rail rate on 1,000 bushels of wheat for a haul of 1,000 miles is $200, the inland waterway rate is $25, and the ocean rate is $20 [4].

In addition to the wheat traffic, the lower lake rates would result in a heavy volume of manufactured products moving to the eastern seaboard from the middle western area. Automobiles from Detroit, harvesting machinery, and steel products and canned goods from Chicago, would use this route. The lower lake ports would also avail themselves of the cheap freights on dairy products and fruit to the European markets. Copper could move economically from Lake Superior and iron ore to the Atlantic seaboard furnaces.

Imports of raw materials and foodstuffs to the lake region would benefit. About 65 per cent. of the American imports of crude rubber (American imports are roughly two-thirds of the total world consumption), moves to states tributary to the

Great Lakes. Large quantities of tea, coffee, sugar, wood pulp, newsprint, and other commodities are consumed in this region, and their present source lies outside. Fertilisers produced outside the region are needed in increasing quantities in the corn, wheat, and fruit belts. Cheap transport rates on these would greatly stimulate more efficient and economical methods of production, with corresponding benefit to the purchasing power of both producers and consumers, lowering the cost, raising the standard of living, and increasing the total surplus available for the production of other commodities, and the performance of services. The waterway itself and the power sites developed would undoubtedly lead to the development of manufacturing plants and settlements, where few or none exist at the moment. In all it is estimated that from United States territory alone about 18 million tons to 26 million tons of additional cargo [4] would move via the proposed new waterway without allowing for any increase in population in the area. This would give employment to some 4,000 to 5,000 vessels. The scheme finds strong support in western Canada, Ontario, and middle western U.S.A.; in a word, in all the districts tributary to the Great Lakes with the exception of Montreal and Buffalo.

It is from these two latter centres and the Atlantic seaboard regions of New York, Boston, Quebec, Philadelphia, and Baltimore, that opposition chiefly, but not wholly, comes. There is little doubt that much of the opposition is rooted in fear of losing trade through the loss of the income now derived at terminals and of the capital invested in the huge equipment which now so efficiently handles traffic. But similar fears have been expressed all down through the history of the development of transport, and it has been usually found that the advantages accruing in other directions more than offset the immediate loss. Thus Utica once vigorously opposed the development of the canal to Lake Erie, fearing the loss of her position as a transhipment point on the way to New York, Leeds opposed the building of the railway to the city, her opposition coming from the vested interests of the older

methods of transport. Yet both of these centres to-day have benefited from that which was of benefit to the whole, though certain scars remain as witnesses of the short-sighted policy pursued.

The specific objections put forward are many. It is contended that ocean shipping is not suited to the conditions of the Great Lakes, that damage will be done to the countryside by the flooding caused by the dams, that it will not be possible to sell the large volume of current developed at the hydro-electric stations, that adequate return cargoes will not be available, that ocean-going vessels have deeper draught in fresh water, that navigation will be difficult owing to the tortuous nature of the St. Lawrence channels, that it will be interrupted by fog, that navigation in any case will only be possible between May and December. Many of these objections are valid; they hold good in respect of the present traffic, and mean that conditions on the lakes are different from those on the ocean. They are not in themselves sufficient to justify the abandonment of the scheme. Similar objections arise in connection with all new developments in transportation. They are overcome by man's adaptation to them.

Of a more serious kind are the objections based on cost. It is estimated that the total cost of the scheme, including the full development of the hydro-electric resources, would be in the neighbourhood of $700 millions [5]. With the same depth of channel, i.e. 27 feet, and hydro-electric development of 1·3 million horse-power, the cost could be lowered to about $400 millions. This cost would be shared between the two countries on an agreed basis as to the advantages accruing to each country. In Canada, especially, with her relatively small population and present large commitments in regard to both transportation and hydro-electric power, the huge expenditure involved for service of the necessary loans in the form of interest and sinking fund charges is viewed with some alarm. Against this it should be remembered that it is claimed that the freight savings effected and the revenue from the electrical energy produced may more than offset the expenditure, quite

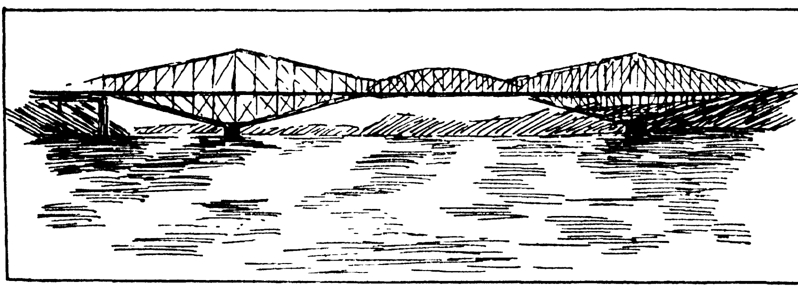
apart from the growth of population and the development of industry which may result. It is not possible to speak with absolute certainty on these points, but that the plan will proceed there is little reasonable doubt. That it will cause striking and interesting changes in the cultural landscape, both in the development of new features and the decline and disappearance of old, is also certain. The new features will concretely express man's adaptation of nature in the effort to produce more efficient means of transportation and greater power facilities than are at present available in this region.

We stopped at Montreal to make this survey. We leave it on board a liner from the Cunard Pier. With a last view of the great galleries and spouts through which the wheat flows from the elevators to the waiting grain-ships below, we swing out into the river on our ten-hour run to Quebec. To port is the low north bank of the river, with clearly visible in the background the high steep edge of the Laurentian plateau (Plate 24). To starboard is the high wooded southern bank, crowned here and there with French villages, the twin-steepled churches of which form a characteristic feature (Plate 24). In the river itself, the channel is well marked by buoys and lights. We pass many boats making for Montreal, general cargo boats, timber boats, and coal boats coming from Sydney, with here and there a great timber raft lazily floating with the current. Shortly we enter Lake St. Peter, a 9-mile-wide expanse of shallow water, the general depth varying from 11 feet to 18 feet, through which the carefully buoyed channel needs constant dredging. We see a dredger at work, an item of the cultural landscape which expresses man's fight with natural law. In the slacking current of the great expansion on its course, the river drops part of its heavy load of silt, torn from the highlands of the Laurentian Plateau by the southward draining streams.

After we leave the lake, Three Rivers appears on our port bow (Plate 24). Sawmills, great heaps of spruce logs fed by belt elevators from the river, coal piers, and then, around the corner, acres upon acres of rafted spruce logs floating on the

surface, are the chief elements of the cultural landscape where the St. Maurice splits into three before entering the St. Lawrence. At the mouth of a stream reaching far back into the heart of the Laurentian Plateau, it has grown from an old fur-trading point, and the third French settlement in Canada, to one of the largest lumber-exporting towns in the world.

Leaving its mile of wharves behind, we observe again the many heavily laden cargo boats making for Montreal, and the interesting arrangement of villages and houses along the banks which led an early writer to say that by sailing up the St. Lawrence one could see all the houses in Canada, an expression



[P. W. B.

FIG. 63.—SKETCH, QUEBEC BRIDGE.

of the French-Canadian land layout. Late in the afternoon we sight one of the wonders of the world, the great Quebec bridge which, with its immense single central span of 1,800 feet, crosses the broad St. Lawrence above the city (Fig. 63). Twice it had to be built, the first bridge collapsing into the river. It forms a striking element of the cultural landscape of railway transportation, with what appears to be a tiny toy train engaged in crossing as we approach. Viewing the giant 14,000-ton Cunarder on which we are, the bridge appears to completely bar our progress. We wait impatiently for it to open to let us through, for it seems incredible that the tall masts and funnels of our vessel should fail to strike (Plate 25). We hold our breath. A moment more and we sweep safely under, with many feet of clearance. This fact, and this alone, conveys some sense of its immensity, for the great steel girders

convey no sense of space or height. We have passed under what is probably one of the greatest optical illusions in the world.

Below we sight the Heights of Abraham, up the slopes of which Wolfe led his men to win for Britain Canada from Montcalm (Plate 26). Beyond the citadel itself climbs steeply from the water's edge, crowned by the Château Frontenac. Quebec, with its walls, its quays and shipping, lies abeam, as we slow to let the tender with passengers and mails come alongside. Many of these have come the quicker railway run from Montreal and join us here. Quebec, except for emigrants, mails, and passengers in a hurry, has lost, with the dredging of the deep-water channel up to Montreal, her proud position as the sea gate of the Dominion.

Below, our tender falls behind (Plate 26). We glimpse, in the gathering dusk, beyond the point of the Isle of Orleans, the Montmorency Falls, 250 feet in height. We cannot see the great power-station at their feet, which converts the water energy into electrical energy for service in the city. In the early morning hours we drop our pilot and last letters at Father Point, and are thrilled by the story of how a great liner was rammed and sunk in fog, in this great estuary, by a cargo tramp. Late that day, the second out from Montreal, we enter the Straits of Belleisle. To south and north of us the hills, late in June, are snow-covered. A stream of ice is in the straits, carried there by the Arctic Current sweeping down the coast of Labrador into the narrow channel separating it from Newfoundland. We call them icebergs. To the sailor they are ' growlers,' the broken fragments of the bergs from Greenland, wrecked by sun and gale on their long journey from the north. We count some seventy-five of them in sight at once, of all sizes and shapes, from pieces the size of a fair-sized room up to floating blocks which seem to tower above our ship (Plate 27). One great mass is piled ashore on the end of Belleisle. The true iceberg zone lies beyond the straits to east of Newfoundland (Plate 27). Here, under the influence of the warm Gulf Stream Drift and the growing power of the

sun, they melt, and the stones and sand and earth they carry frozen into their mass, sink to the bottom and help to build the fishing banks. The true iceberg covers many acres of sea. One such we see and carefully avoid, for its projecting foot which we glimpse far from the main mass with broken water in between would soon rip the bottom from our ship.

Great banks and clouds of fog roll down and momentarily blot out the coast. The note of our engines changes as we slow down. Full speed ahead under such conditions is madness. The harsh, strident note of our siren thrills us. To hear it in the gathering dusk is weird; to hear it at midnight in our berths adds mystery and terror; for fog is the seaman's greatest foe. All else at sea he faces with confidence and skill. Against fog he can do nought but wait and watch, and send his shrilling warning to others of his kind.

These waters are especially liable to fog. The cold northern current streaming southward from its Arctic source fits in between the Gulf Stream Drift and the coast. A southerly wind from the warm surface waters charged with water vapour crosses the cold stream. The moisture condenses and forms mist and fog. Hence, the sailor prays for, but all too frequently fails to get, a north wind here. Few vessels enter the St. Lawrence without experiencing some delay from fog, which may vary from a few hours up to a day or more. On another trip to south of Newfoundland we missed a heavily laden freighter by a matter of feet in a thick fog.

For the remaining 2,000 miles to Liverpool there was little of the cultural landscape to see beyond an occasional steamer, even on the traffic lanes of the North Atlantic, for the number of vessels is lost amid the immensity of the distance. Early one afternoon we pick up our pilot on the Clyde. Here we tranship passengers and goods to tug and lighter for Greenock. We saw no scenery on the St. Lawrence to equal that to be seen on the run up the Clyde estuary. The scale is smaller, to be sure, but the piled-up mountains and delightful glens of the south-western highlands contrast sharply with the frowning, savage-looking bulwarks of eastern Canada.

Early next morning we cast anchor off the bar at the entrance to Liverpool. A crack Canadian mailboat lies just ahead. The sands off Liverpool are a difficult problem for shipping. Much work has been done in the construction of seawalls and dredging to keep open a passage, but large vessels have still to await the tide. With rising tide and the lead going we follow the twists and turns of the channel through the sands (Plate 28). To left of us is a wreck, its back broken on one of the submerged seawalls. It sought to enter Liverpool Harbour in a gale with this result, Nature used man's efforts to secure a clear passage, to effect her blind, destructive ends.

As we approach, the great docks and terminals of Liverpool appear in view, dredged from the low-lying shore. A little later we go ashore at the famous floating landing-stage, the Prince's Wharf which, coupled to the land by steel bridges, overcomes the big rise and fall of the tide in the Mersey estuary (Plate 28). We note the elaborate bridge-like equipment for landing passengers, and see our heavy baggage go hurtling down the long slides from the tall ship's side. A few minutes later we are in the Customs Building satisfying the uniformed officials that we have no prohibited articles stowed away in our trunks. This building and its mechanism symbolises Britain's effort, regarded from one point of view, to raise additional revenue, from another, to protect her manufacturers from undue foreign competition.

At Liverpool we are at the other end of the long, deep waterway from the upper lakes, over 4,000 miles from our starting-point, and at the port to which much of the traffic originating there will ultimately come when the lake improvements have been carried out, for Liverpool, apart from London, is the greatest distributing point in the British Isles. Grain, flour, cheese, butter, meat products, fruit, harvesting machinery, motor-cars and spare parts all originate around the Great Lakes and find their way to Liverpool to-day. One of the weaknesses of this great waterway is the lack of sufficient balancing return cargo. The factors are too many and complex to more than glimpse the future, but that they will bring

about many and striking changes in the cultural landscape of transport, especially in the North American area, there is no room to doubt.

Along the great waterway we have come we see man's efforts to adapt nature to serve his need for transport expressed in the many varied forms of the cultural landscape. The buoys and lights mark his deep-water channels, the jetties and sea-walls concentrate the current and force Nature to deepen her channels, the dredgers do their share, the canals avoid nature's obstacles, the vessels, crews, passengers, and cargo are movable elements of the cultural landscape, the great terminals with their wharves and docks, their cranes and other loading and unloading equipment, their elevators, warehouses, and customs buildings, express his need for transhipment points from ship to rail or road. Nature opposes man's desire. He bends her to his will. The features of the cultural landscape evidence the resulting struggle and conquest of the lakes, the rivers, the currents, the rapids, the falls, the estuaries, the ocean itself, its gales, its ice, its fogs, the coastal rocks and shallows, and the natural sites on which he has placed his terminals. Back of all this and essential to it are the cultural landscapes of production, the fields and farms, the factories and the mines, for it is to move his products that he needs his waterways.

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Chapter 13

THE CULTURAL LANDSCAPE OF THE CANADIAN PACIFIC RAILWAY

The Canadian Pacific Railway considered as an example of man's struggle with and conquest of nature's forces. Railway patterns.

We have studied the cultural landscape of a great water route. To study that involved in the construction of a great railway we cannot do better than follow the Canadian Pacific Railway from the Rockies eastward to the tide. The C.P.R. is more than a mere railway. It is one of the greatest colonising agents in history, the most potent single factor in the creation of the Dominion of Canada, and an Empire builder with few equals. Its construction was a great drama in time and space, a struggle with immense natural conditions and forces, a monument to the vision, the enterprise, the courage, the tenacity, and the skill of those who built it. They faced 2,000 miles of almost unpeopled country in which nature was supreme. They faced a complicated mountain barrier of many great ranges, thickly forested and ice crowned, through which no pathway existed, the home of bear and wolf, elk, deer, and eagle. They faced a climate in which frost goes 4 feet deep, in which their water-saturated embankments froze and fell to pieces with the thaw, in which great avalanches and shale slides overwhelmed their laboriously constructed tracks. They faced raging bush and forest fires which swept away their timber structures, and sometimes took their lives. They faced marsh and swamp and slough in which their structures sank. They faced raging torrents and untamed floods. They faced hunger and thirst, sickness, and hostile Indians. They won through all. They built the track from sea to sea.

Begun in 1871, completed in 1886, seven years ahead of

time, it is one of the finest achievements in the history of engineering. As no public corporation could be found to finance a railway through a region with little population and less products, the Canadian Government subsidised the Syndicate which built it to the extent of $25 millions and 25 million acres of land, the latter divided into alternate sections of 640 acres extending 24 miles deep on each side of the track. Other privileges were granted, including exemption from land tax on the grant and freedom from competition for a period of twenty years. These measures helped to finance the heavy expenditure incurred both in constructing and operating the line. But they were supplemented by the vision of men like Mr. Donald Smith, afterwards Lord Strathcona, who pledged the whole of his large private fortune to back that vision.

Standing outside the railway hotel at Glacier, in the Selkirks, we are surrounded by massive glaciers and ice peaks. We are 4,000 feet above sea-level in the very heart of that massive barrier, composed in the main of the Rockies, the Selkirks, and the Gold Range, which separates British Columbia from the prairies and the east. Below us is the West Portal of the Connaught Tunnel 5 miles long under Mt. Macdonald. This tunnel was recently built to avoid the heavy gradients of Rogers Pass, by means of which the railway engineers first conquered the difficult barrier of the Selkirks. Here the head-waters of two streams, the Illicillewaet flowing south-westward and the Bear Creek draining north-east to the Columbia, have cut back till they nearly meet at the summit of the Pass (Fig. 64). Above the Pass tower the mighty ice-capped peaks of the Sir Donald Range, the source of many an avalanche and rock slide, which necessitated the 4 miles of snow sheds on the single-track railway line below. Through this Pass in 1886 roared the first train from Montreal to the Pacific coast, along the line built to link the 10,000 people of British Columbia, the population of a small English county town, over a distance of nearly 3,000 miles, to their brethren in the east, and bind them to the British Commonwealth

rather than to their great neighbour to the south of the International line.

Boarding the Trans Canada Limited, the finest train on

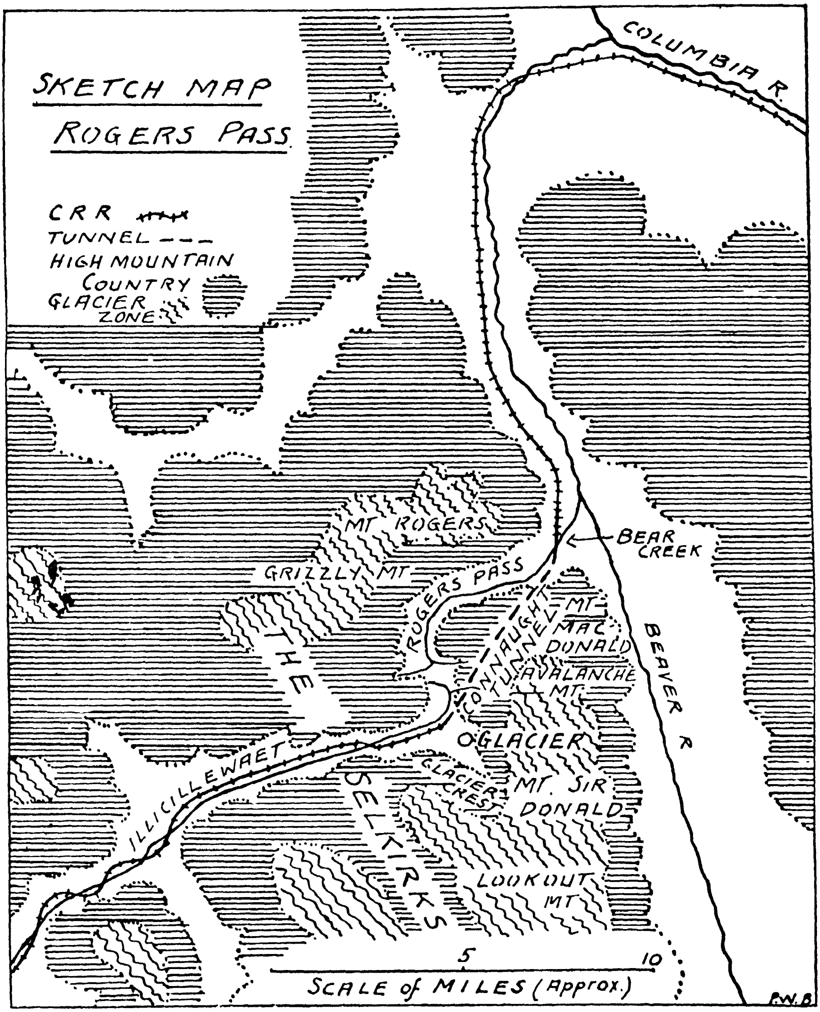

FIG. 64.—SKETCH-MAP, ROGERS PASS, SELKIRKS.

the finest track in North America, we enter the tunnel. Soon we leave its East Portal, and swing smoothly down Bear Creek and Beaver River to the floor of the great trench occupied by the Columbia, separating the Selkirks from the Rockies beyond.

The wide flat-floored trench is partly wooded. Beyond the woods great steep-sided, thickly forested, snow-clad mountains rise on either hand. We leave the trench at Golden. Entering the Kicking Horse Canyon, we begin our long climb through range after range to the summit of the Kicking Horse Pass at Stephen, some 40 miles beyond. Projecting spurs on

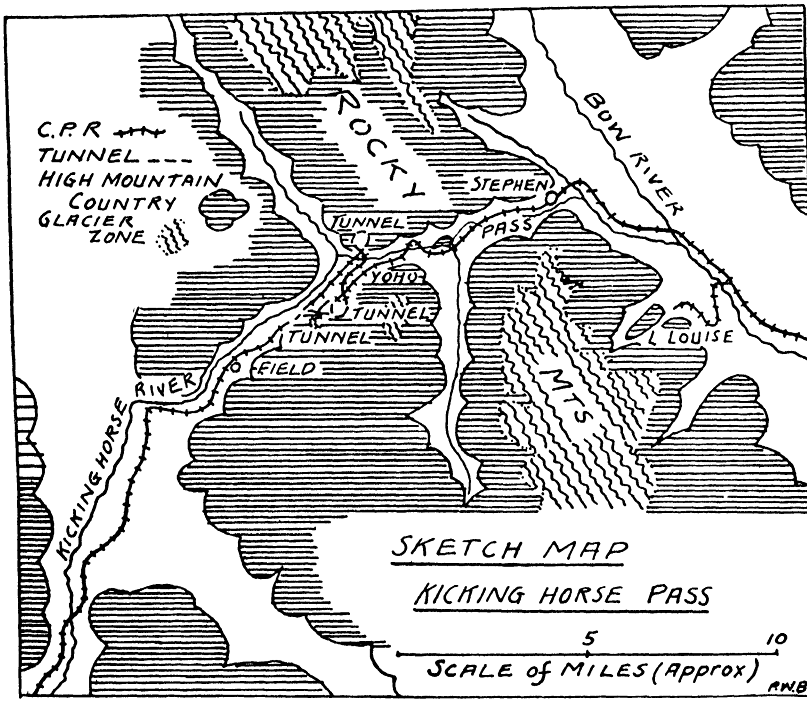

FIG. 65.—SKETCH-MAP, APPROACHES TO KICKING HORSE PASS.

the way up cause many tunnels. At Yoho, within 5 miles of the summit, the gradient becomes so steep that the railway is forced to zigzag across the river on high trestle wooden bridges and to use two circular tunnels one at each side of the valley. The line penetrates at a lower level, and then by means of thc circular tunnels emerges at a high level, the added distance in the tunnel meantime reducing the gradient. As we emerge from the last tunnel the upper Kicking Horse Canyon lies below us. In a few minutes we cross it and skirt the beautiful Wapta or Kicking Horse Lake. Three miles away, 200 feet

above, is the summit of the Pass, over 1 mile above sea-level. Through miles of dense forest, on trestles overhanging rushing torrents, clinging in places to the face of precipices on ledges blasted from the living rock, through tunnel after tunnel sunk in the mountain spurs, we have climbed 3,000 feet in 40 miles from the depths of the great Columbia trench to the notch in the main range (Fig. 65). Parts of this single line through the mountains was built at a cost of $200,000 per mile of track. In terms of labour, thought, and material it stands for man's effort to establish communication through these mighty ranges—an effort concretely expressed in rail and cutting, bridge and tunnel, snowshed and embankment.

Had we come through in winter we might have been held up while a gigantic snow plough, pushed ahead of one to four engines, with a rotary borer in front, cut a passage for us through some deep drift piled by the wind in a cutting or narrow valley. Or we might have waited at some wayside station for the removal of a slide of rock loosened by melting snow, thawing ice, and sun. We would have waited in comfort, for the Trans Canada Limited is splendidly equipped, while the toiling men outside faced the bitter cold and cutting wind, themselves enjoying comparative comfort by comparison with those who carried the steel tracks first through.

From Stephen we swing rapidly down the long slope to the Bow River Valley, which carries us through the foothill country to Banff and Calgary. At Banff we look back and see the mighty front range towering up, a snowy barrier which only hints at that which lies beyond. At Banff in the gorge of the Bow River we have passed through the real portal to the mountain country beyond. Here is the beginning of the Rocky Mountain Park, a region attracting increasing numbers of tourists annually, and had we the time, we could have taken the short motor line to visit beautiful Lake Louise set in the edge of the great main range surrounded by mighty peaks and glaciers. This tourist traffic, together with the hotels, and huts provided for visitors, forms an important aspect of the cultural landscape, and an increasing source of C.P.R. revenue.

A little later we run into Calgary, the largest city of the plains after Winnipeg (Fig. 66). We have left the foothills behind with their heavier precipitation, and enter the great ranching and irrigated lands of Alberta. Immediately beyond the city on our right we see one of the great irrigation canals, developed by the C.P.R. to settle this semi-arid region. Later we pass several reservoirs for storing water. This is derived from the Bow River, well fed with water from the glaciers

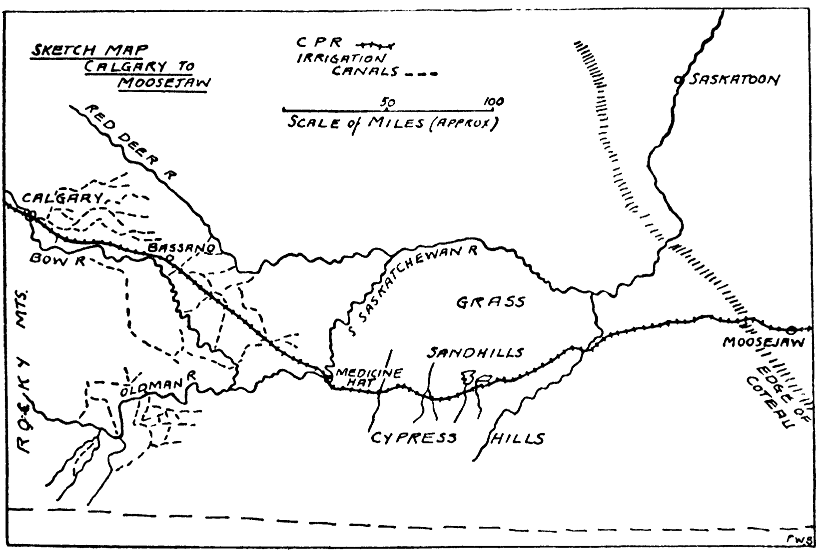

FIG. 66.—SKETCH-MAP, CALGARY TO MOOSEJAW.

and snows of the great main range behind, through which we have come. These works extend over 150 miles of country from Calgary through Bassano to Medicine Hat. The rainfall in this district is very variable within limits of 8 to 15 inches, the average being about 11 inches per annum. We are on the edge of the ranching country where normally there is insufficient rainfall to grow wheat. Deserted farmsteads where farming has failed are evidence of changing conditions. Cattle docks at wayside stations indicate the major activity. The future lies in ranching in the better-watered areas and above all in irrigation. It is calculated that about 2 million acres can be irrigated. About 250,000 are now under the

plough with the aid of irrigation water. At Medicine Hat we cross the South Saskatchewan. The city lies by the waterside some 300 to 400 feet below the prairie level, for the river is a typical prairie river deeply trenched below the surface.

Beyond the country changes. We enter rolling foothill country. To right we see the outlines of the Cypress Hills, to left a patch of sandhills, veritable dunes, which fill us with amazement. They are a striking commentary on the nature of the country and the lack of rain. We are south of the Great Sand Hills region of western Saskatchewan. Small patches of sand dune, strips of barren alkali land, large areas of thinly grassed land with a few cattle are the chief features to be seen in this unattractive region. Beyond it we come down off this steppe-like country and enter Moosejaw on the edge of the second prairie step, and on the fringe of the wheat country stretching westward to Winnipeg.

The railway stretches in an undeviating line mile after mile across this region. The characteristic feature of the country is its remarkable flatness, contrasting sharply with the irregular country we have just crossed. At one point a parallel track of the C.P.R. extends for almost 100 miles in a straight line. In this great flat expanse to south-east of Moosejaw there are five main lines about 10 or so miles apart. No features occur, but those of the cultural landscape of wheat farming and the railway itself to break the universal flatness. We are in a land of rich black and brown soils, the product of glacial till, long centuries of grass growth and decay, and weather conditions which have favoured rapid growth and prevented the too rapid decomposition and loss of plant food. Remote from markets for the surplus product, the region was unsettled till the coming of the railway. Little wheat to-day is hauled more than 20 miles, the limit normally of profitable farming. Hence the great parallel lines of rail which provide the farmer with an economical haul for his grain (Fig. 67).

The railroad pattern is the expression of the nature of the activity on the one hand and the natural environment on the

other. Definite, clearly marked railway patterns everywhere are usually the result of the interrelationship of these two groups of factors. The simplest type, a straight line between points, is found where man desires to link two centres for transport of goods. Such is the single-track line from Ookiep to Port Nolloth in Cape Colony. Such were the coal lines built to the Tyne in the early days of railways. They developed in time into the herring-bone pattern at each side of the river to-day. Seldom are they straight. Curves, cuttings,

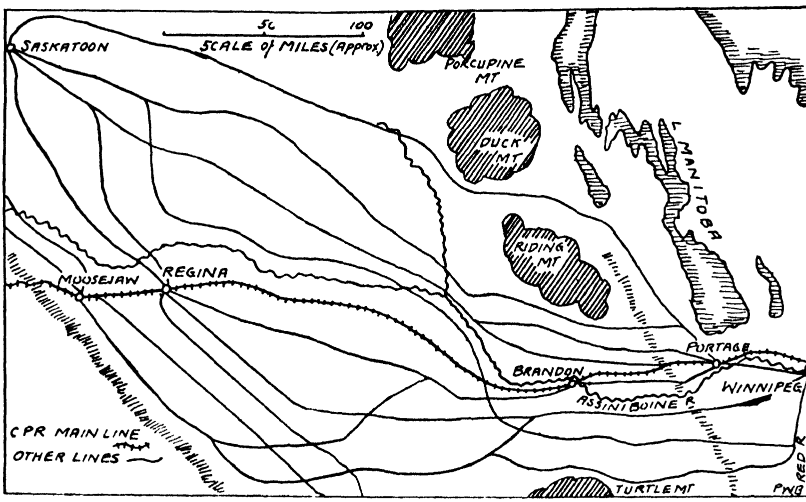

FIG. 67.—SKETCH-MAP, RAILWAYS OF WHEATLANDS.

bridges, embankments, break the regularity of the pattern, forced on man by nature's irregularities. Long single-track patterns still exist from Sydney to Bourke, and Rockhampton to Longreach. Short branches giving a tree-like pattern develop from single tracks. Around a nodal point development rapidly takes place. The usual pattern is then radial from an inland centre or half radial from a port. The amount of radiation varies with the topography and the nature of the activity. Thus a centre like Birmingham is completely radial, like London almost wholly radial, like Chicago about three-quarters radial, like Liverpool half radial, like Winnipeg a sheaf tied in the middle with a string to the south. The

sheaf is badly tied, for the bulk of the stalks are on one side, the prairie side, a fact perhaps not without significance (Fig. 68). In each case it is man's desire restricted by the physical setting which determines the nature of the pattern.

In time the fanning out of the lines from individual nodal

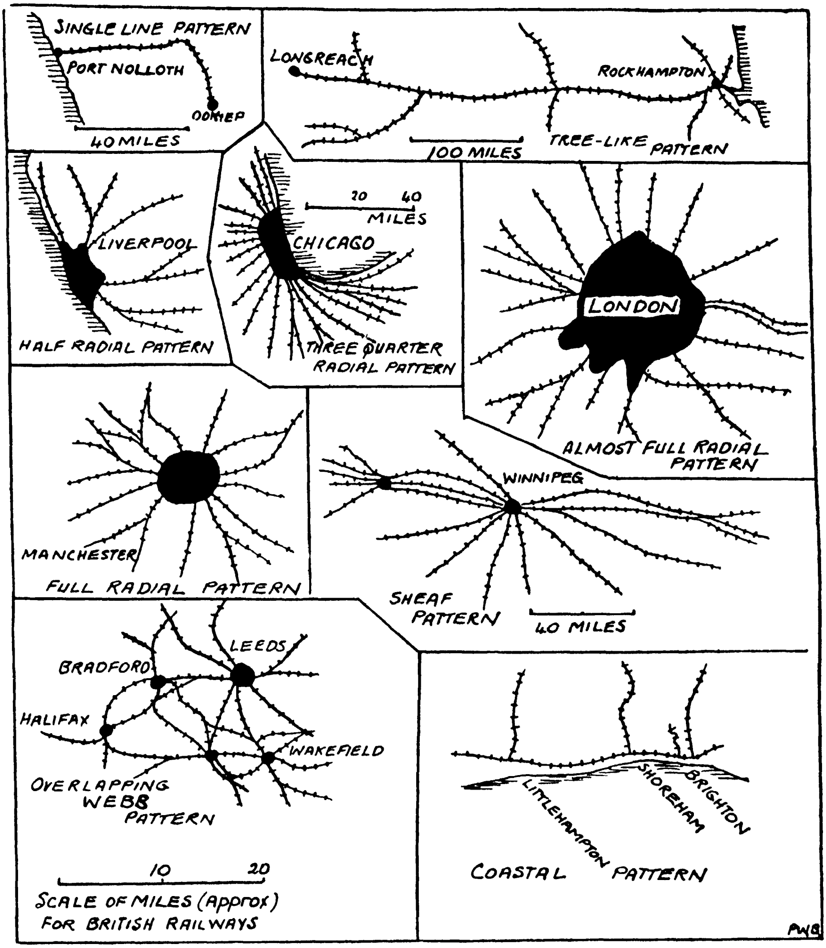

Fig. 68.—RAILWAY PATTERNS.

points merge, cross connections are super-imposed, and there results a definite railway net which has the appearance of a number of overlapping spiders' webs rather than a net. A net usually implies definite rectangularity, but a series of webs introduce that nodality which is such a striking characteristic

of railway patterns. These patterns are seen at their best in densely peopled manufacturing areas, where the need for railway transport is at its maximum, but a study of the railway maps of different countries reveals the patterns in all stages of their growth, for in addition to the factors of the kind of activity carried on and the nature of the natural environment, the pattern depends on the state of man's knowledge and development in any area, coupled with the amount of capital and labour available for railroad construction.

On the second prairie step railways originated, not as elsewhere in response to the demand for movement between existing settlements, but to bring about the settlements themselves. With the coming of the rails, settlers followed and took up free land or land sold by the C.P.R. Farming developed in long, narrow zones across the wheat country, the width of these zones being about 40 miles or so with the railroad in the middle.

Leaving Moosejaw for our 40-mile run to Regina, we are in the heart of some of the finest wheat country in Canada, the western part of the second prairie step, stretching from around Saskatoon in the north-west towards the International frontier in the south-east. In this region the acreage under wheat has increased nearly 50 per cent. in the last ten years. Every station has its elevator or groups of elevators, to which the farmers haul their grain for sale or consignment to the pool, the organisation which markets a large proportion of the grain on behalf of the farmers. In the fields on either side of the track we see the combined harvester-threshers busily at work gathering in the wheat. Some of these machines will cut and thresh over 1,000 bushels of wheat a day, covering 50 acres of ground. In 1929 there were over 7,000 of these at work in western Canada! With them and other modern machinery it is possible to carry on at low costs the extensive system of farming practised in this region. All of this vast harvest of 300 million bushels feeds the railways, and is the main justification for their growth. We have left the single line of the mountains, the foothills, and the ranching country far behind.

Our line is double-tracked from here to Winnipeg, and thence beyond to the wheat-shipping points at the head of Lake Superior—Fort William and Port Arthur. This in itself evidences the heavier traffic of this fertile belt to Winnipeg, the double-tracking beyond Winnipeg being due to moving, not to originating, grain.

Beyond Regina the land of eastern Saskatchewan is not so fertile. Grain is still with us, but there is much scrub-covered land to south and north. It tends to be a mixed farming zone rather than a purely wheat country such as we have passed across. Beyond Brandon we come down from the second prairie step on to the flat floor of old Lake Agassiz. Here are some of the finest wheatlands in the world. Great piles of straw and chaff, looking in the distance like, and having the same contour as, sand dunes, form striking elements of the cultural landscape. Most of the threshers have gone. The wheat is gone. There remains only these great piles of waste. At night the burning piles, for no use as yet has been found for them, light up the countryside, a pitiful waste, for burnt they only add potash to the soil. The white-painted farm-houses and the red-coloured barns are characteristic of the better farms. Wooden posts and hog wire mark the boundaries. The rectangular layout of the roads and fields gives a curious regularity to the pattern, in spite of sloughs and patches here and there of waste land in the sandy or badly drained parts of the great lowland. Occasional timber clumps known as 'bluffs' help to break the monotony of the landscape.

At Portage south of Lake Manitoba, we are in the heart of the Portage Plains, which contain some of the best wheatland in the province. The soil is very fertile, rich in plant food, but very sticky when wet. It is known as gumbo. In dry weather tractors are used for ploughing here, but in wet, horses are very much better. As we run through Portage we see a line of great elevators belonging to different organisations flanking the tracks (Plate 29). A belated farmer's wagon is under one delivering his load of grain. Before the coming of the elevator it took a day to load a railway car with grain.

From the elevator spouts to-day it takes exactly fifteen minutes to do the same work. The saving in the cost of handling is very great. It is one of the principal factors in lowering the cost of wheat. The elevator is a characteristic expression of man's adaptation of nature to facilitate his need for efficient transport. Near-by in an enclosure off the main street is a regular battery of harvesting combines brought by the railway to facilitate the getting in of the great harvest (Plate 29). The year we came through the harvest was over in late August, an exceptionally early date due to dry weather, in which the wheat headed out on short straw much before its usual time. But though the crop was short it was heavy, averaging 65–66 lb. to the bushel.

The roads feeding the railway in this district are rather rough. They are gravel roads for the most part, and contrast strikingly with the fine concrete roads of the Corn Belt in U.S.A.

Towards evening we run into Winnipeg, the focal point of all wheat traffic from mid-Saskatchewan to eastward. To west of that point in Saskatchewan wheat is moving increasingly to the Pacific seaboard at Vancouver, the through rate to Liverpool being about the same via either route, while the congestion due to the closing of the Great Lakes by ice, and the need for several breaks in bulk are absent from the Pacific route via British Columbia and the Panama Canal.

From the standpoint of the cultural landscape of railway transport the most striking feature of Winnipeg is the great trainyards with their flanking elevators, flour mills, and repair and equipment works (Plate 30). Those of the C.P.R. are the largest individual railway yards in the world. They contain over 300 miles of tracks. Here the train crews are changed, and the wheat is sampled, a sample being taken from every car, and the train of from forty to forty-five cars, each containing from 1,000 to 1,600 bushels of grain, is on its way to the head of the lakes in about one hour. During the busy season, over 2,000 carloads of grain are handled here each twenty-four hours, and the work is continuous for seven days a week and

twenty-four hours a day. All this grain is moving from an area in which, in 1874, the farthest west settler was 10 miles beyond Portage la Prairie. To-day in Winnipeg we are looking at the activity of the cultural landscape in the greatest wheat-handling point in the world, for Canada is now the greatest of the world's wheat-exporting countries, contributing nearly 40 per cent. of the world's total export.[1]

It is no part of our work here to discuss the many factors which led to this amazing development, but it should be stated that in it the railway played a major part. It led to the settlement of the wheat country. Through its aid, and through its aid alone, could the huge surplus grain production of the prairies, which makes Canada the greatest single factor in the wheat trade to-day, be moved to satisfy man's need for bread in Britain and north-western Europe. It was not till the beginning of the present century that the really large-scale movement of wheat began. The railway linked the wheatlands to the rapidly expanding Old World demand for bread in the industrial centres. This demand was much increased as a result of the War and the decline of Russian export. With the threatened 'come-back' of Russia,[2] and the development of production in other regions, the western Canadian farmer is faced with the problem of his almost sole dependence on one crop and with the penalties of 'wheat mining,' problems which are now being solved, partly through railway aid, through the growth of mixed farming, and the application of fertiliser to the partially exhausted wheatlands.[3]

In relation to all this, Winnipeg, situated in the bottle neck between the lakes to the north and the International frontier to the south, occupies a commanding position.

[1] Average of 1924–9, 38·8 per cent.

[2] One thousand million bushels in 1930.

[3] During the post-war period, Canada's wheat average has more than doubled, and her wheat exports have trebled, without corresponding increase in population. (Average, 1933, 10·0 m. acres; 1930, 25·3 m. acres.) At the same time the world production of wheat has increased more rapidly than the world demand.

Through her all traffic moves. She has thus developed as one of the world's great railway nodes. In the '70's of the last century a log fort, at which the H.B. Co. traded with the Indians for furs, occupied her present site between the Assiniboine and the Red Rivers. To-day, some sixty years later, she has a quarter of a million inhabitants, who mostly eat, live, and think in terms of wheat and railroads, terms which here, as we have seen, are very nearly synonymous.

In the gathering dusk we swing out of the great city on our all-night run to the upper lake ports (Plate 31). A short distance to east we enter the fringes of the Laurentian Shield. The rest is silence save for the rhythmic beat of steel on steel as we rush through the night, and the maze of lake and forest, stream and marsh which separate us from Fort William. Before we turn in we pass Kenora, on the Lake of the Woods, a growing tourist centre which can only be reached by rail, unless one is prepared to take to canoe or cut one's way through undergrowth and swamp.

In the early dawn we slow down at Fort William. Here are miles of great elevators (Plate 31). Some are owned by private companies; others by the Pool and by the United Grain Growers. Alongside are many typical lake boats, with the bridge in the bows, the engines and funnel in the stern, and between, a great hold capable of carrying many thousands of bushels of grain. Over one-fourth of this grain is destined for Great Britain [2]. Four miles farther on we run through Port Arthur, the twin of Fort William, on the natural harbour at the mouth of the Kaministiquia River. Here the cultural landscape is similar. We see many more great elevators and many more steamers alongside with holds gaping for the flood of new grain from the prairies beyond. Both towns are situated on the sheltered Thunder Bay, at the head of Canadian lake navigation, and at the end of the shortest line, within Canadian territory from Winnipeg to Lake Superior. The construction of the railway to this point through forest, swamp, and rough irregular topography presented many difficulties. Swamps had to be drained or firm causeways

built across them, hollows had to be filled in, gradients smoothed, bridges constructed over savage rivers, and broad zones, to minimise danger from fire due to engine sparks, had to be hewn through some hundreds of miles of forest country.

Beyond Port Arthur we are back to single track again, which winds and twists along the shore between the water's edge and wild-looking cliffs and precipices to shoreward. Bold rocky promontories come down through which are many cuttings and tunnels. In between are wild streams and small beaches, with here and there a tiny fishing settlement. Off the coast are many rocky wooded islands. The land is covered with stunted forest growth of pines, poplars, and aspens. We thunder over many causeways and embankments, bridges and rivers, midst an ever-varying scene which at last becomes monotonous from very repetition of the same essential elements, cliff and island, shore and water, trees and wild rivers, fishing settlement, and rocky sloping promontory. Save the waterway, it was for many years, till the recent building of other transcontinental lines, the only link with eastern Canada.

At Heron Bay the tracks leave the lakeside and climb by way of the Black River valley up on to the plateau beyond. We are on the glaciated Laurentian Shield. The topography is very irregular in a minor way, sufficient to cause an endless repetition of little cuttings through the low rises, and short stone causeways over arms and corners of the innumerable small lakes. The whole is lightly forested with stunted pines (Plate 32). We pass through small wayside stations whose chief features are the double tracks for passing, the small station house, the large water tank, and the complete absence of any platform. Sometimes we pass a shack or an Indian encampment near the rail. Here and there we see an Indian walking the tracks, for in this country the easiest road is along the level railroad track stepping from tie to tie, the wooden cross-beams on which the rails are laid. In England they are called sleepers. Every twenty miles or so we pass a little gang of men whose business it is to repair these ties.

These section-men's shacks are often the only habitations for many miles. They move to and from their work on trolleys, a square wooden platform on four wheels worked by handles. Along difficult parts of the line a regular patrol is kept up to warn trains if danger lies ahead in the shape of rock slides or other obstructions on the track. At night the great headlight of the engine lights the track for many yards ahead. Under such conditions the pines are weird and ghostlike and mysterious, hinting at unknown depths beyond, and one can imagine the forest peopled with strange and awful shapes lying in wait for man, to punish his presumptuous daring in driving a track bearing a roaring monster through their primeval fastnesses.

During the night we descend from the plateau and run through Sudbury to north of Georgian Bay. We are in a mineral area discovered through the building of the C.P.R. and now an important source of traffic for the line. Here at Sudbury the vegetation takes on an air of desolation, for we are close to the smelters of Copper Cliff and Coniston, where the nickel, of which this district produces 90 per cent. of the world's total, is prepared for shipment. Sudbury is an important railway junction, for here six lines focus in the low ground between the plateau and the head of Georgian Bay. The Transcontinental (G.T.R.) alone avoids it by going far to north through Cochrane. In this zone also, but far to north, lie the gold mines of the Porcupine district and the silver and cobalt mines of the Cobalt district. Mineral developments here and at Sudbury may lead to increased traffic in the future.

We now swing eastward along the old French route by Lake Nipissing and the Mattawa River to the Ottawa. We follow its valley for over 100 miles, till in the morning we swing close to the river between Renfrew and Arnprior. On the river are great timber rafts moored to the shore. On shore are timber mills and enormous stacks of cut boards. As seen in the early morning mists, the river looks broad. The clearing mist reveals the opposite shore. The near shore looks more like a sea or lake beach than that of a river bank

130 miles from tidewater, and yet it is only a tributary of the mighty St. Lawrence, which it joins at Montreal 1,000 miles from the open Atlantic.

The country we are running through is mostly farmed for dairying. There are many Holsteins in the fields. Split wooden rail fences, hedges, and modern hog fences, are common, each probably representing a separate stage in the development of the cultural landscape, for all this country was once under forest, and the farms had to be painfully won yard by yard from the native cover of timber. Here and there are old decaying stumps, the evidence of nature's former sway. Trim farms and buildings complete the cultural landscape of agricultural occupancy. The track is level over many miles. Level crossings and country roads are evidence of the flat topography, though here and there occasional smooth bare rock coming through with timbered gullies indicate a solid structure not far below the level surface that we see.

Soon we run into Ottawa. Vast timber rafts cover the river. Big sawmills, from which we hear the hiss of steel teeth biting into logs hauled on endless chain carriers from the river, are on every hand. Stacks upon stacks of sawn planks resembling huge buildings with narrow streets between are in the yards. Behind lie the great Chaudiere Falls, the source of the power. Beyond to north, up the Gatineau and other rivers, are the pine forests, from which the chief material comes on which Ottawa depends. Many wooden houses and timber sidewalks are to be seen in parts of the city. Ottawa is the chief lumber centre of this part of the Laurentian Plateau. Contrasting sharply with all this are the handsome Parliament Buildings on a prominent site overlooking the river and its timber activities, for Ottawa is the federal capital of the Dominion. Ottawa thinks mainly in terms of two things—politics and timber, and timber is the more important of the two.

Leaving Ottawa behind, after a short run we enter Montreal. We are on tidewater, at the end of the great railway which begins at Vancouver on the Pacific at the other

of the plains, up steep mountain sides, in deep canyons, along sheer precipices, westward, ever westward, men carried the twin steel, timber-bound track.

Their work to-day and all it stands for is concretely expressed in this same track, in bridge and cutting, causeway tunnel and embankment, in station house and elevator, in wheatfields, irrigation works, and tourist centres, in ports and cities, settlements and trainyards, in man, and much of his activity in something more than half a continent. Such are the main aspects of the cultural landscape of the C.P.R., expressing man's relationship to nature in the construction and operation of the finest means of transportation in the great Dominion.

1. Report of Imperial Economic Conference, *The Wheat Situation*, 1931.
2. U.K. Trade Returns.
3. "Wheat Studies," *Food Resources Inst. Stanford University*, vol. 6, No. 10.
4. "Crop Repts. and Agric. Statistics," *Inter. Inst. of Agric.*, October 1930 and October 1931.
5. Jones and Bryan, *North America*, chapters 15 and 32.

Chapter 14

THE CULTURAL LANDSCAPES OF NEW YORK, WASHINGTON, AND PITTSBURG

The cultural landscapes of New York, a great seaport and financial centre ; Washington, a great administrative, scientific, and æsthetic centre ; and Pittsburg, a great manufacturing centre, studied as representing three highly contrasted examples of modern civic activity. The harbour works, skyscrapers, and communications of New York, the administrative buildings, scientific institutions, memorials and monuments of Washington ; the coal mines, steel works, factories, and offices of Pittsburg, to mention but a few of the forms of the cultural landscapes of each, are concrete expressions of the highly contrasted adaptations of nature in each.

In an earlier chapter an attempt has been made to classify roughly cities, and to indicate some of the ways in which their many differing activities are concretely expressed in their cultural landscapes. No attempt is here made to deal exhaustively with the cultural landscapes of Washington, New York, and Pittsburg, but merely to indicate something of the impressions made by these landscapes on a visitor's first contact with them, coupled with some general preliminary study of illustrations, maps, and written material. The result is therefore necessarily somewhat superficial, but may serve as an example of what may be done in a hasty survey by one viewing the cultural landscapes of regions visited with the eye of a geographer. What follows is therefore essentially geographical description, together with certain inferences as to the geographic relationships of which the cultural landscapes described are the objective expression.

Our first contact with New York can usefully begin in the London Docks from which we sail. As we are towed by a tug out into the river opposite Woolwich we find great ships from New York unloading the products of America into the

barges which play such a large part in handling the traffic of London River, as sailors call the Thames (Plate 33). A little lower down we see barges being filled with wheat from New York, and still lower a group of barges being towed down river to refill from some great ship nearer the sea. From one point of view all these things may be regarded as the far-flung outposts of New York, for the boundaries of every great port are only delimited by the seven seas, and no aspect of New York is more interesting and striking than that which treats of her as the greatest seaport, outlet, and inlet of the New World. Later, as we pass the Goodwins, that grave of tall ships, and see a deserted hull starkly on the sand, we glimpse something of the perils faced by the seafarers of the great port, and of the relatively impermanent character of the vehicle of ocean traffic when opposed by nature as storm and shallow, in face of which the lightship, set there for protection by man in normal circumstances, may prove of no avail.

Space does not permit of any detailed consideration of the approach to New York across 3,000 miles of ocean, but certain outstanding impressions remain vivid in the mind. Of these the blunt chalk cliffs of Dover, castle crowned, speaking of the past, Dover harbour with its great breakwaters, man's effort to defy the sea, where we drop our pilot and letters, our last link with England, and a striking view of the English coast at sunset, as we swing across the Channel to France, stand clear in memory as the terminal in a general sense of the trackless waste of waters we are about to cross. Had we sailed from Southampton we would have seen another of New York's contacts with this country at an ocean terminal of a different sort. Southampton's great wharves and floating dock and crane would have made more definite to us a growing ocean terminal specialising in passenger traffic, and contrasting sharply in organisation, mainly for environmental reasons, with that of London. Had we left it in such a vessel as the *Berengaria* we would have crossed to Cherbourg and taken on board a supply of fresh vegetables and fowls from the fertile cultural landscapes of Normandy. As it is, we touch at Boulogne,

glimpse it rising steeply from the sea, and while waiting for passengers bound from Paris to New York, see the tall spike of the Napoleonic monument on the chalk cliffs to the north, erected to commemorate the attempted invasion of England.

Then day after day the open Atlantic, with day after day an unbroken circle where sea and sky meet, make us feel we are living in a little New World of our own, whose boundaries from one point of view are the sides of our ship, the only visible form of the cultural landscape, and from another that unbroken circle of sea and sky, within the limits of which the only life seems to be an occasional gull. The preparations for an approaching storm signalled from far ahead, help us to realise the importance of wireless to modern Atlantic crossings, and to feel that we have some contact with, and guidance from, the outside world. The storm which follows teaches us something of the immensity of Atlantic waves, even when viewed from an elevation approaching that of modern chimneys, the promenade deck of a liner. We glimpse something of the problem of ocean transportation, and are grateful for the inventive genius of those who have developed the vehicle of sea transport to such a pitch as to grapple in comparative comfort and safety with this experience. The peace which follows after the storm but serves to accentuate the storm itself. To any traveller in these circumstances must come a feeling of awe and a glimmering of comprehension of what Columbus and the early discoverers of the New World must have done in crossing this waste of waters in tiny cockleshells which could have been stowed away in a corner of our great vessel. We realise further, that while man has done much to transform the face of nature on land, he has done nothing to change, though much to combat, natural forces and conditions at sea.

Ten days from London early one morning we sight the outlying cultural landscape of New York, the quarantine station at the entrance to the bay, at which all ships are compelled to stop to receive medical inspection and to pass the immigration authorities. Many ships are ahead of us, so we wait our turn (Fig. 69). We fill in our time looking about us

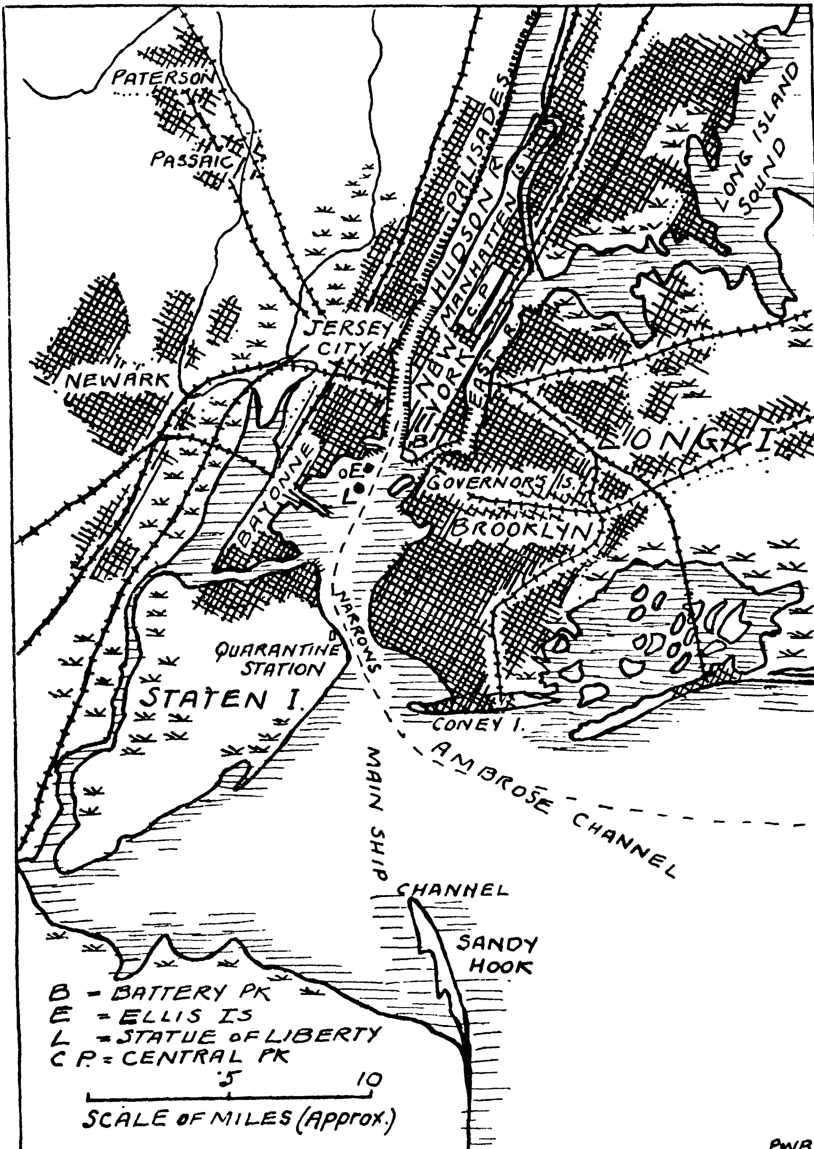

FIG. 69.—SKETCH-MAP, NEW YORK BAY.

as the port awakes to the traffic of the day. Near us is a great French liner from Le Havre. Bustling up the bay in striking contrast is a Hudson River passenger boat, looking rather like a terrace of houses afloat. Between the two, a mere speck on the water by contrast, is a submarine chaser, now used to chase the rum runners from 'rum row.' A train ferry crosses from the New Jersey shore making for Brooklyn, a huge cargo steamer bears down on us as if about to ram, but shifts her helm in time, and astern the *Leviathan*, the largest liner afloat under the American flag, anchors to await her turn. This business of inspection and regulation reminds us that great nations are becoming particular as to the future composition of their population, and that man himself, together with his characteristics and aptitudes, customs and habits, is the most important item in the cultural landscape, since to him its activity is due in the first place, and on him and the satisfying of his desires depends its character as the chief motivating force.

While waiting permission to proceed farther up the bay to the landing-piers, we can usefully fill in the time examining the geographical position of New York (Fig. 70). There are two general environmental facts dominating the cultural landscape of New York. The first is its general position at the mouth of what geographers have come to call the Hudson-Mohawk Gap, that long, narrow passage-way which, between the Appalachians on the one hand and the Berkshires and Adirondacks on the other, leads right into the heart of the middle west, and makes New York, when coupled with the magnificent bay at the mouth of which we are lying, the major outlet for the trade and passenger traffic of the U.S.A. The second major fact is the rocky Manhattan Island on which the city stands. It definitely limits all expansion except upward.

Having seen the immigration authorities climb aboard and received medical inspection, we raise our anchor and slowly steam up, in a day of bright sunshine, the magnificent bay at the upper end of which the city stands. To our left we see

the oil storage tanks and refineries at Bayonne on the New Jersey shore, to which the oil comes on its long journey, in some cases half across a continent, by pipeline, representing man's adaptation of nature in the effort to develop fuel, some of which has carried us across the ocean. Farther up, the statue of Liberty lifts its 305 feet high into the air, a symbol of

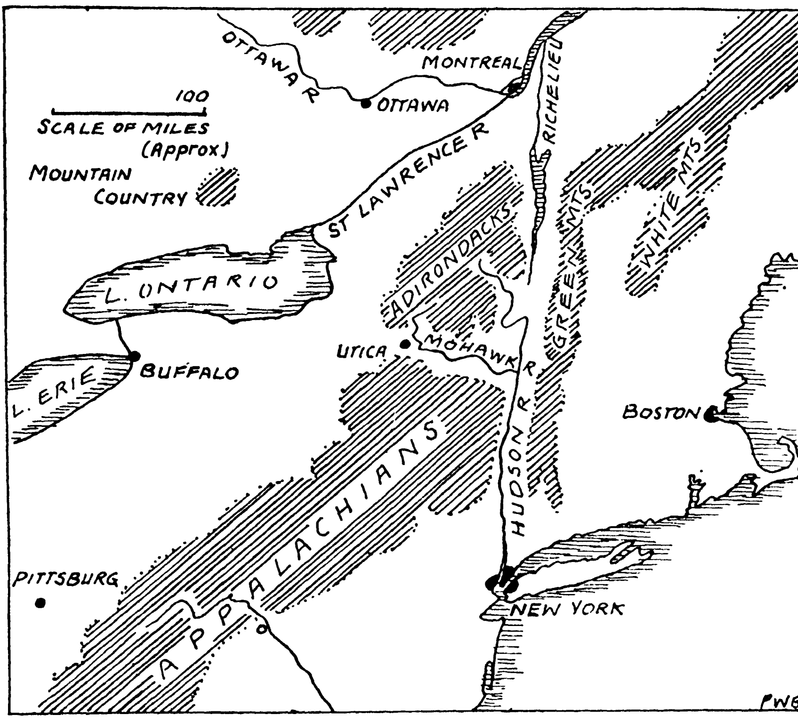

FIG. 70.—GENERAL POSITION OF NEW YORK.

the French people's regard for the new republic, and a token of international friendship and esteem. To the right the skyline of New York begins to pile up, forming a sight unique among cities, and one which forces us to exclaim in admiration of what is an architectural achievement without parallel. As we close in towards our pier it becomes still more impressive (Plate 34). We can pick out and recognise individual sky-scrapers. The Woolworth, the Telephone Building, the great Chrysler, giant of them all, form peaks in the architec-

tural mountain range which impress through sheer bulk apart from their individual beauty.

It is difficult to convey to the mind in mere words the impressions created by proximity to the skyscrapers. At one time they impress you with the grandeur of magnificent mountain scenery. Looking up at the beauty and grace of the Savoy Hotel from the lake in Central Park one has this feeling (Plate 35). A similar sense is conveyed looking up the side of one from the street below at window cleaners at work on what look like toy planks running on threads, which are really stout steel cables ; or looking up the great white way, as Broadway is termed, at night to the *Times* clock on its skyscraper pinnacle. From the summit of the Woolworth Tower one looks down on great buildings 500 feet and 600 feet in height, and gets a totally different impression (Plate 36). The tiny plumes of steam puffing from the great buildings at one's feet reminds us that New York is heated by central furnaces fed by the Pennsylvanian anthracite field, and conveys a curious effect that one is looking down on some grotesque pieces of mechanism or even gigantic teddy bears, the playthings of some giant race responsible for all this. One's first thought, overriding this, on looking down on the people in the streets from the summit of the Woolworth Building into Broadway, looking down a sheer 800 feet to the antlike moving entities on the pavement far below is, what an insignificant thing man is in the immensity of these strange buildings and contrivances. But that is only a hasty misconception quickly replaced by the nobler and truer concept of man as the motivating force behind, and the creator and builder of, this strange new cultural landscape in which he appears to be so small and insignificant.

From the summit of the Woolworth Building the whole cultural landscape of New York is spread out, as it were, at one's feet, and one looks out beyond to the New Jersey shore lost in haze on the one hand and to Brooklyn with its great bridge linking it to New York on the other. Far to the north the city disappears in mist in the direction of the Harlem River. Manhattan Island is long and narrow. The city is laid out in a

series of long north-south avenues, with short cross streets running from the Hudson River on the one hand to the East River, separating New York from Brooklyn, on the other. Giving the island something of the appearance of a man with a raggy, stubbly beard, New York is fringed by the numerous piers jutting out into the water. They are rendered necessary by the great traffic concentration and the impossibility of constructing docks (Plate 34). As a terminal, therefore, it contrasts sharply with London, the main difference lying in the environmental contrasts of the two ports, the markedly tidal character, and extensive stretches of marshland adjacent to, London River having no counterpart in New York.

The solid basaltic foundations, and the restricted limits of Manhattan Island made the skyscrapers not only possible, but the only solution of the problem of New York's limited area. The skyscrapers are, as it were, keyed deeply into the living rock. Better foundations could possibly nowhere be found ready to hand. As a result the cultural landscape of New York is constantly changing to meet the growing demands for accommodation. Old buildings are pulled down and replaced by skyscrapers. The visitor to the city is struck, even in a casual survey, by the number and depth of the excavations in progress with this end in view (Plate 34), that of anchoring firmly into the solid basalt new buildings to care for the city's growing need for shelter.

Not merely is the problem one of shelter, but one of traffic congestion. New York, controlling the bulk of the traffic of a continent, is the headquarters for many of the great American business firms. It has a growing volume of goods and passenger traffic, growing through sheer momentum as much as anything else, quite apart from its more local problem of shifting its huge population several times daily. Long before the days of the tubes the narrow dimensions of Manhattan Island led to the construction of the elevated railway over some of the main north-south avenues to give a double line of traffic the one above the other. Below this are now the tubes, only constructed with great difficulty and expense, thus pro-

viding the city with a triple layer of traffic-ways. The traffic congestion in the streets is increased by the numerous taxis, the great army of buses and trams, and the many lorries and motor trucks needed for handling goods. Traffic control was early developed here along the lines of the coloured light system with which we are becoming familiar now in England. Striking aspects of the cultural landscape of New York are the tall control towers carrying these lights by means of which the city traffic can be regulated from central points. In the early days these towers were each separately controlled by a policeman stationed inside, who changed the lights to suit the changing traffic at difficult points. The rectangular layout of most American cities lends itself to this system to a much greater degree than the irregular layout of most Old World cities, where many streets may join at various awkward angles, as in such a centre as Trafalgar Square, London.

In studying, however briefly, traffic control in this city, one cannot help being struck by the immense variety of nationalities forming part of the cultural landscape in the streets, on the tops of buses, among the workers at the lunch hour, and in the names over the shops. Among these the Chinese perhaps most strike the Western eye. Laundries, and many eating-places are run by them, and if one takes one of the night trips arranged in New York, one visits the Chinese quarter, including a Chinese temple and sleeping-house. In the dim light of the interior of the temple one glimpses strange gods and finds oneself in an atmosphere entirely Eastern and strange. Most European nationalities as well as negroes are represented in the crowded streets. The coloured porters at the railway terminals and on the Pullman cars, the Irish police, the Italians and Jews in the fur and textile quarters of the city, the eastern Europeans in many different occupations, the Swedes in domestic service, coupled with the restricted dimensions of the island which forces these varied peoples closer together than in many other cities, all contribute to that cosmopolitan atmosphere which is so characteristic of New York, and help to remind us that the city, because of

its position, is essentially the gateway for the great continent which lies beyond. It may perhaps be usefully thought of as an epitome of that melting-pot of races out of which a new nation with Anglo-Saxon ideals in the main, but of increasingly non-Anglo-Saxon composition, is being rapidly forged, with what results for the future of mankind only that future can tell.

Flowing from the restricted dimensions of the island, few New York contrasts are more striking than that of the juxtaposition of slums and magnificent buildings. The long north-south avenues are mostly lined with magnificent buildings,

FIG. 71.—CENTRAL PARK, NEW YORK.

but the short cross streets all too frequently consist of rather appalling slums. The tenement buildings in these slums, from the one to the other of which washing may be seen hanging out to dry in long lines, are backed by magnificent skyscraper suites of offices or hotels (Plate 37). Into these side streets from the tenement blocks rubbish of all kinds is heaved out of the windows, speaking eloquently of the conditions within. This almost incredible fact has to be seen to be believed.

Having seen and marvelled at this aspect of the cultural landscape of the great city, one is totally unprepared for Central Park (Fig. 71), for here in the heart of New York, within a stone's throw of some of these amazing slums, one

finds a stretch of parkland in parts of which one could imagine oneself back in the original country which once covered the island. Rock and timber and wild birds are much as they may have been when Indians owned the island, now occupied by the greatest city in the New World, and forced the inhabitants of New Amsterdam to build a wall to keep them out. To-day Central Park forms a unique breathing space and playground for the inhabitants of the city, and for the children of the canyon-like streets into which, owing to the height of the buildings, the sun penetrates for a few moments each day. A similar open space on a much smaller scale is Battery Park at the extreme south end of the island, overlooking the Harbour towards Ellis Island on which are the buildings of the Emigration Departments. We were fortunate enough to avoid them.

Any glance at the cultural landscape of New York, however brief, would be incomplete without a reference to one of the most famous streets in the world—Wall Street. It runs to the east off Lower Broadway (Plate 38). The name Wall Street, however, connotes not merely the street itself, which is named after the line of the ancient wall across the island built to defend the early settlers from the Indians. The term 'Wall Street' covers the whole of the financial district, comprising many of the adjacent streets and the financial operations carried on there. Here in New York is concentrated the bulk of American financial control, much as is her political control at Washington. Where better than here at her chief gateway should one find the centre of her widespread financial mechanism dominating the production and distribution of her goods ? Financial control has a peculiarly direct reference to the affairs of business life, hence it is best found in direct contact with the centres of that life. Political control in the broadest sense is unfortunately sometimes thought of as having less direct reference to the more urgent necessities of that life. In America it is relegated to the relative backwater of Washington.

On the south side of Wall Street, facing each other across Broad Street, are the Stock Exchange and the Pierpont

Morgan Building, the one dominating the buying and selling of securities representing part ownership in industrial and other concerns, the other the headquarters of the most famous financial house in the world. On the front of the Stock Exchange building, the central figure of the pediment, a woman in flowing robes with arms outstretched, represents Integrity, the bulwark of sound finance. On either side are groups representing the products of the soil, mining, motive power, and the mechanic, the four main basic facts on which commerce and industry rest.

Passing down Wall Street and turning to look back towards Broadway, one sees in the centre of the picture the ancient Trinity Church dominated by enormous office blocks on either hand. George Birmingham, in his book *From Connaught to Chicago*, suggests that were an eagle to visit most cities and comment on what he saw, he would say that in Europe religion was foremost in the minds of the citizens, since their churches and cathedrals dominate their cities, but that in New York he would be likely to conclude that commerce and industry swamped everything else in importance in the eyes of the citizens there, since their churches are lost amid the great office blocks and skyscrapers towering heavenward on all sides. This in spite of the fact that Trinity Church lifts its cross nearly 300 feet above the pavement (Plate 38).

Were we to run home after the day's work with some of the principal characters in the daily drama of Wall Street, we would be introduced to a totally different aspect of the cultural landscape of the city. To the north by the Hudson, on Riverside Drive and on Upper Fifth Avenue, are the homes of many of the New York millionaires. Riverside Drive is laid out in a double line of traffic separated by a long belt of trees and grass, beyond which there is a magnificent outlook to west over the Hudson (Plate 38). Here and there by the driveway between it and the river are splendid monuments. Of these the tomb of Grant, who commanded the victorious northern forces in the Civil War, is typical. Over the entrance are the words "Let us have peace," taken from the conclusion

of the letter in which he accepted nomination to the presidency of the United States—words which formed a fitting end to that fratricidal conflict.

A low plateau, Mornington Heights, near the upper end of Riverside Drive, is crowned by the library of Columbia University. This centre of learning dominates upper New York and in due time no doubt will penetrate and dominate with its spirit the whole city, thus neutralising the corrupt political atmosphere and business graft which is all too prevalent in the 'down town' districts of the city.

There is no time in such a brief inspection as we must necessarily make here to examine the many other striking aspects of the cultural landscape of the city. The grouping of its main shopping districts, of which probably Broadway and Fifth Avenue are outstanding, its many national quarters, its varied commercial and municipal activities, the elaborate transportation systems which, under the Hudson, and across the East River, link it to Brooklyn, Long Island and the vast continent lying beyond the Hudson, would amply repay such detailed study as that suggested in Chapter 4. Such a study would take years, and will doubtless be undertaken by future students of the city with profitable and interesting results. New York, like other civic centres, may perhaps be best regarded as a functioning organism, closely related to its natural environmental complex, functioning in the main as a great seaport, the principal gateway of the New World, and as a centre of business administration and finance with London as its only equal. New York's other activities tend to be subsidiary to these main functions. As such the city is connected primarily with the performance of services to American production rather than with production itself, services which her unique geographical position eminently fit her to render.

Someone has said, "New York is wonderful." It is a vague phrase, but somehow hits the nail on the head. If one said that to an American, he might probably reply, "You've said a mouthful," meaning thereby that it could hardly be better expressed. In spite of her slums, in spite of her appal-

ling local politics and business graft, New York is wonderful, and one cannot help feeling an intensity of admiration for the grit and determination which has here made great achievement possible, assisted, it is true, by great natural advantages, but also hampered by physical disadvantages by no means inconsiderable. To some New York is depressing. If you are one of those who are constantly depressed by contemplating how far you have fallen short of what you might have been and done, then truly you are in for a rough time here, but if you are rather one of those who take great achievement as a challenge and a spur to greater effort on your own part, then New York will act on you as a stimulant, and every skyscraper will be a finger pointing the way upward and onward, pointing it cheerily and confidently with rock-like steadfastness.

Passing down West 32nd Street, with the huge mass of the Pennsylvania Hotel on our right, we enter what the New Yorker affectionately terms the Penna Station, and leave for Washington. Our negro Pullman conductor takes 'motherly' charge of us and after a few hours' run we arrive early next morning at one of the most beautiful buildings we have ever seen, the Union Station at Washington. Many of the larger railway stations in the United States are fine pieces of architecture. They are less numerous than Old World stations in proportion to mileage, the cost of construction per mile of track being much lower, so that part of the surpluses available would appear to have gone into these magnificent buildings. They give the traveller that first good impression which is so pleasing. Immediately outside the station one gets a good impression of another kind. The 'honour' system of newspaper sales seems to be fairly general in the United States. Papers are left in a clip or container with an adjacent box, into which one drops the necessary coin, no attendant apparently being considered necessary

Visiting Washington in fine weather, the most vivid general impression which remains in mind is that of glorious white buildings set amid brilliantly green luxuriant trees, shrubs, and grass, bright hot sunshine, and at night an all-

pervading, subtle, subtropical, and wholly delightful fragrance of aromatic plants (Fig. 72).

Washington is primarily the capital for administrative purposes. It therefore contains the National Capitol, the building which houses Congress and the Senate. It is beautifully proportioned within and without. Its halls, rooms, and corridors are decorated with huge paintings illustrative of incidents in American history, of which the Landing of Columbus and the Embarkation of the Pilgrim Fathers are two of the most significant. Frequently Sousa's famous band plays before the Capitol. On such nights Washington gathers to listen. The magnificent flight of steps at the main entrance to the Capitol serves as an excellent grandstand free to the people. The dome of the Capitol illuminated by reflecting lights, the varied crowd, the band, and the lights of Pennsylvania Avenue diminishing in the distance, together with the relative cool of the warm subtropical night, and the subtle, delicious odour of subtropical plants, which seems more intense in the cooler conditions of the evening, combine to produce an unforgettable experience (Plate 36).

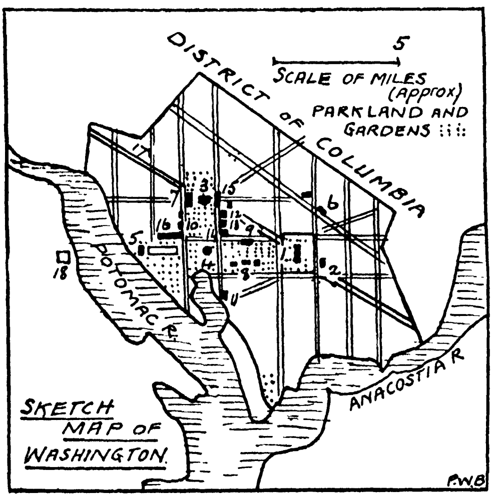

FIG. 72.—SKETCH-MAP OF WASHINGTON.

The layout of the city is the normal rectangular layout of most American cities, modified to some extent by the winding of the Potomac on the banks of which it stands, and by a series of great diagonal avenues radiating from the two chief centres—the Capitol, and the White House or Executive Mansion, the home of the President. Pennsylvania Avenue,

one of these diagonals and the finest thoroughfare in Washington, links these two. Flanking it on either hand are stately buildings. Near the White House are the great Departments of State, including the Treasury, the State, War and Navy Departments, and the Departments of Commerce and Labour.

Adjoining the Capitol is the famous Library of Congress, by some considered to be the most beautifully decorated building in the world. The net cost of the building alone was over 6 million dollars. Perhaps its chief features are the wonderful series of ceiling and mural decorations illustrative of outstanding ideas, figures, and stages in the development of literature, and to a lesser degree of art, science, music, philosophy, law, and religion—in a word, a vast conspectus of the progress, the unfoldment of the human race. On the walls are quotations from the great writers. Two of these remain in memory as seeming particularly appropriate, the one, "Ignorance is the curse of God, Knowledge the wing wherewith we fly to Heaven," the other, "Wisdom is the principal thing, therefore get wisdom; and with all thy getting get understanding." The one indicating that the primary function of a library is to facilitate the acquisition of knowledge; the other that we must not rest at mere knowledge in the narrow sense, but must carry our studies to the point of understanding.

The Washington monument, one of the four outstanding features of the city, the other three being the White House, the Capitol, and the Lincoln Memorial, is placed between the two latter on a low hill in a straight line running westward to the Potomac. It is an obelisk or shaft of white marble with an interior backing of New England granite. Its height of nearly 600 feet makes it not only the highest work of masonry in the world, but the dominating feature of the city. The shaft is beautiful in its very simplicity, and its beauty is enhanced by the way in which, on a day of cloud and sunshine, it reflects the constantly varying lights which play on its great length. To see it reflecting for, say, 400 feet of its length, the blazing rays of sunset after the sun has set below

the normal horizon, is to carry in one's memory a vision of beauty not easily forgotten. It commemorates the man who is regarded as the illustrious father of his country [1], the loftiness of whose principles were indisputable, the purity of whose life has been seldom equalled, whose character was beyond reproach. The monument in its height, simplicity, and beauty fitly symbolises the man. It is a shrine at which all the world may fitly uncover.

From its summit one gets magnificent views over the city. One looks eastward to the Capitol, with the Library of Congress beyond and the Union Station at which we arrived to the north. In the middle distance are the grounds of the Smithsonian Institution containing the main building and the National Museums. The Smithsonian, occupying a distinguished place among the learned societies of the world, stimulates and encourages scientific study of varied types, including expeditions to different parts of the world. Close by but nearer to hand is the Department of Agriculture. To southward one overlooks the Potomac and the Bureau of Engraving and Printing, where the American paper money is made. To north lies the White House and the buildings housing the Navy Administration and the Pan-American Union, the Navy building being one of the few ugly buildings of any size in Washington. Directly to westward, at one's feet as it were (Plate 39), lies the long vista of reflecting lagoons leading up to the Lincoln Memorial, a magnificent white marble temple on a slight eminence overlooking the Potomac, beyond which can be dimly seen the Arlington National Cemetery, with its amphitheatre and field of the dead, set up to honour those who gave their lives that the country might live.

To me the Lincoln Memorial is one of the most beautiful buildings I have seen. It has four main features. The first is a statue of the man himself, set in the central hall. In his serene gaze one reads the consciousness of his power and the sustaining confidence which carried him and his country successfully through the terrible years of the Civil War. The

Union which he saved from disruption is symbolised in the thirty-six columns, one for each state, of the colonnade surrounding the temple. The next feature is a memorial of the famous Gettysburg speech cut in the wall of the south side of the hall. This address, given when dedicating part of the field of Gettysburg to the soldiers who fell there, contains the oft-quoted words, so applicable to-day, " It is rather for us to be dedicated to the great task remaining before us . . . that we here highly resolve that these dead shall not have died in vain ; that this nation, under God, shall have a new birth of freedom ; and that government of the people, by the people, for the people, shall not perish from the earth." Lastly, and perhaps the finest of all, is a memorial of his second inaugural address, which possibly more than anything else reveals the inner spirit of the man. " With malice toward none, with charity for all, with firmness in the right, as God gives us to see the right, let us strive on to finish the work we are in." Surely no greater or grander practical philosophy can be reduced to print. Reverently, hat in hand, Americans approach the memorial. So I saw one who was looking back along the reflecting lagoons towards the tall, slender column of the Washington Monument, from the entrance to the Lincoln Memorial, thinking probably of the life and work of the two great Americans here commemorated amid such magnificent surroundings.

Of the many other aspects of the cultural landscape of Washington there is no space to speak. The city, set on a peninsula at the junction of the Anacostia and Potomac Rivers, at the limit of navigation produced by the Fall Line, with its large southern and negro population, its subtropical climate, typified by the sun umbrellas used by the policeman on point duty, its air of leisure and culture and its position near the old boundary line between north and south, the Mason-Dixon line, is well placed to be the nation's capital, and a great administrative, scientific, æsthetic centre and shrine, the focal point of all that is best in American life to-day. All this is aptly expressed in its inhabitants, their activities,

their buildings, memorials, monuments, and the general layout.

Between Washington and Pittsburg stretches the massive barrier of the Appalachian Mountains—ridge after ridge separated by deeply cut valleys. Of these ridges, the first,

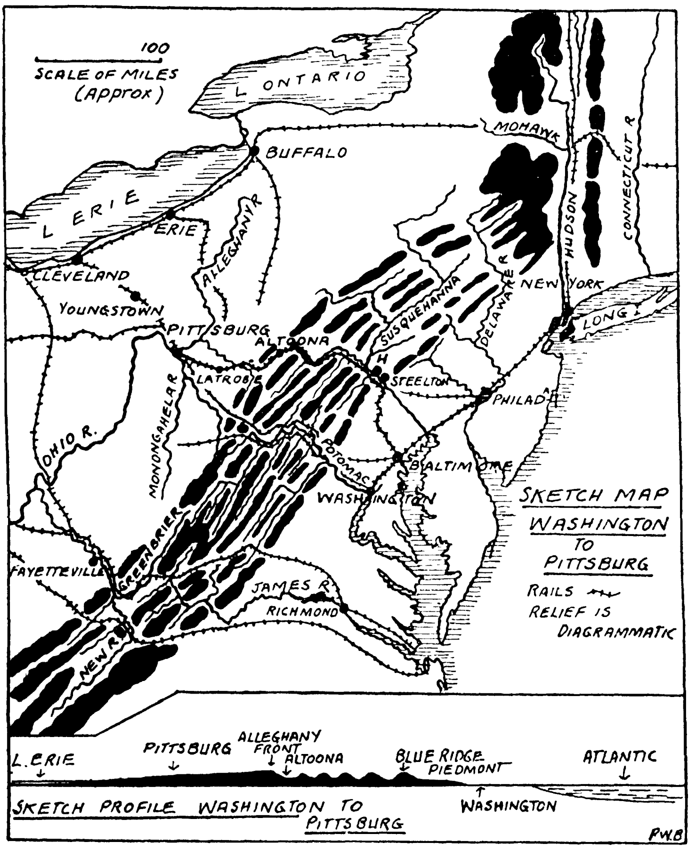

FIG. 73.—SKETCH-MAP, WASHINGTON TO PITTSBURG.

the Blue Ridge, is the most formidable. At the far side of the system of ridges lies the Alleghany Front, the steep eastward facing escarpment of the plateau on which Pittsburg is situate. Fortunately, from the standpoint of communications, two rivers, the Potomac and the Juniata tributary of the Susquehanna, flow eastward from this edge, cutting deep water-gaps

through ridge after ridge, finally emerging on the eastern coastal plain. On the plateau beyond, a series of streams focus on the position of Pittsburg, the city being located on a peninsula between the Monongahela and the Alleghany, streams which unite to form the Ohio. Of the two routes thus provided by nature through the ridges, that which we are about to follow leads from Washington by Baltimore to Harrisburg, at the water-gap where the Susquehanna cuts its way through the Blue Ridge, and thence up the Susquehanna and its tributary, the Juniata, to Altoona at the foot of the Alleghany Front. Then by way of the Horseshoe Curve, which climbs the face of the escarpment to the plateau beyond, and through the industrial centres of Johnstown and Latrobe, it leads to Pittsburg (Fig. 73).

The train which takes us to Pittsburg is interesting in many respects to European eyes. There is something that strikes one as very odd about an American engine. Much bigger than most European engines, it impresses one's unaccustomed European vision as being vaguely indecent, reminding one of those weird pictures by Heath Robinson in which the working parts of a machine seem to be hanging in festoons outside it, instead of being decently, but possibly less efficiently, tucked away inside. It was also our first and last experience of a day coach on long runs. The day coach has no adequate protection from the filthy soft coal American engines burn, and unless, as is the case with the Pullman cars, one's coach is fitted with a kind of fine wire netting over every possible opening, one emerges at one's destination indistinguishable almost from a particularly dirty negro. Further, unless one keeps all the windows shut, producing insufferable heat in summer, one stands a good chance of having one's eyes damaged by pieces of cinder from that same coal. To a photographer—and much good work can be done with care from a moving train—a day coach is almost a necessity, as the netting of the Pullman cars seriously interferes with effective work. To open the netting calls down reproof from one's suffering fellow-passengers. The ideal from the photographer's standpoint in

these long runs is the observation car fitted, however, to all too few trains, and costing many dollars.

Leaving Washington early one morning, we run through farming country, in parts of which deserted farmsteads and fences, overgrown with weeds, and being rapidly reclaimed by nature, indicate a cultural landscape disappearing as a result of migration to better lands farther west beyond the mountains. The vast stretches of poor weed-covered land or unreclaimed land strike one vividly in the New World, a land of abundant area, in which experimentation is freely and rapidly tried out. Casting back in memory to England, the English countryside, with its trim hedges and farmsteads and intensive cultivation, appears garden-like by contrast.

Apart from Baltimore, we come to our first glimpse of industrialism in the great steelworks at Steelton on the edge of the Blue Ridge, by Harrisburg, based on the anthracite coalfield, lying beyond to northward behind the ridges. This coalfield, set in the contorted and twisted strata of the ridge and furrow structure of the Appalachian system, though difficult to work, produces a high grade of anthracite, used mostly to-day for central heating. It was once the basis for the Atlantic seaboard iron industry of the U.S.A., yielding a greater heating capacity per unit of bulk than bituminous coal until replaced by the development of coke as a blast-furnace fuel [1].

Beyond Harrisburg the river at first is broad, narrowing markedly as one gets through the ridges, the chopped-off ends of which are clearly visible as we pass. In the intervening valleys are many little farms, the outstanding elements of which are the barns and other outhouses and the patches of cultivation (Plate 40). Farther on we get beautiful glimpses of the river and of the dense primeval forest, which because of soil poverty will probably never be reclaimed for cultivation, hence much of the region in the future will remain a playground for the people and a happy hunting-ground for campers and hikers and others of that ilk (Plate 40).

After a run of about four hours from Washington we reach

Altoona, sprawling, as is the habit of many American cities, at the foot of the great Alleghany escarpment. We climb the escarpment by the famous Horseshoe Curve, a misleading name, as there is not one, but many curves to be negotiated. We pass the great reservoir which, gathering water in the hills, supplies Altoona with its needs. Our route lies through mighty forest country, to-day much as it was when the Indian, the bear, and the deer lorded it throughout the land.

Reaching the summit, the contrast is marked: the forest disappears, and the country takes on an air of desolation, enhanced rather than diminished by the deep valleys cut down into the face of the plateau exposing the coal seams near water-level [1]. Here and there are straggling mining villages on the valley sides, frequently located on the shelf or bench or terrace left by the over-deepening of the valleys in past geological times. Bigger towns appear as we progress, with houses all of the same pattern, the backyards full of tin cans reflecting in part the American habit of eating quantities of tinned foods, and in part the general untidiness and haste of the foreign element in the population of these mining areas, and the rather unsatisfactory conditions under which they live. Trainloads of coal consisting of huge wagons, many times greater in size than those used for handling coal in England, steel-built and efficiently equipped with hoppers for discharging loads, appear to be the main traffic on the line.

As we approach Pittsburg the cultural landscape becomes more and more industrialised. Factories, great steel works (Plate 41), coking plants, spur lines of rail, rolling stock of all kinds form its chief elements. The district we are now entering rapidly is not merely the greatest steel centre of the United States, but is far and away the greatest steel centre of the world. The area of which Pittsburg is the capital and focal point produces more coal each year than all the coalfields of Great Britain rolled into one, and turns out nearly twice as much steel as the whole of the British Isles.

Approaching this centre late in the evening as we are now doing, with the sky illumined by the lurid flares from the

furnaces mingled with clouds of dense smoke, and the all-pervading sense of dirt and gloom, intensified by our railway experience, it is no exaggeration to say that we are forced to feel as if we are entering some modernised version of the nether regions.

The city, set on its low peninsula between the two rivers (Plate 41), is reached through a deep cutting, and has the usual rectangular layout. Down the short cross streets one can look to the high steep banks beyond the rivers, at the foot of which is the terrace already referred to, and on which are located a series of steelworks (Plate 41). At the wharves are great three-decker passenger steamers and tugs with trains of coal-laden barges behind, for much of the coal from up-river moves to Pittsburg by water along the canalised Monongahela, the main natural obstacles to which movement, now that canalisation has been effected, are ice and fog. The deeply trenched Monongahela has exposed the famous Pittsburg seam near water-level [1]. Some 70 per cent. of all the coal won in Pennsylvania is won by slope rather than shaft. Thus the coal is readily and cheaply brought to the waterside, and shipped into the barges lying alongside the river terraces where navigable water is available. Where it is not available, the terraces form admirable routes for railways centring on this and other cities of the district. The uniformity and average 6-feet thickness of the seam makes for ease of machine mining, while the general down-grade to the city reduces transportation costs, an important consideration in relation to the need for a minimum of effort in handling the bulky inward freight in coal. In general, the cultural landscape of the coalfield lacks the characteristic overhead winding pitgear with which one is familiar in most other coal-producing regions. On the railways to west and north-west of the city the characteristic movable elements of the cultural landscape are great trainloads of iron ore moving up from Lorain, Cleveland, Ashtabula, and other Lake Erie ports to which the ore has moved down the lakes from the chief iron-producing region of North America at the western corner of Lake Superior [1].

Throughout the Pittsburg district one is struck by the dominating part played by structure and relief in conditioning human settlement, coal production, and manufacturing industry.

In the Pittsburg streets at the lunch-hour and in the evening one cannot help remarking the distinctively non-Anglo-Saxon element in the population. Many of the workers in the mines and steelworks are eastern Europeans and negroes, the latter increasingly numerous as the quota system operates to limit the normal influx of other nationalities, with results which may have interesting reactions on the future composition and development of the American nation.

From the point of the peninsula, the tip of the city projects like the prow of a ship into the mingling waters of the two rivers blending to form the Ohio. One looks north-west to the high steep bank to left of the Ohio and east to a low stretch of land occupied by the city's gasworks and a series of great steelworks wrapped in the all-pervading gloom and smoke. The picture typifies Pittsburg, once a defence point in the early French and Indian wars, later a jumping-off place for the stream of adventurers moving with the current down the river to the conquest of new lands in the Middle West, to-day in essence a forge and focal point for the greatest steel district in the world [1].

In conclusion, on the basis of these rapid surveys of their cultural landscapes, we venture to generalise on what these three cities appear to stand for in American life and thought. New York, Pittsburg, and Washington are at the angles of a rough isosceles triangle (Fig. 74). New York and Pittsburg are at each end of the base, with Washington at the apex. This arrangement may serve as a useful mnemonic for the relationships of the three centres, for it is cities like Pittsburg primarily and New York secondarily which make Washington possible.

New York is above all else the gateway to and the exit from the New World, the point of contact with the Old, the spout of the melting-pot where enter the many races which go to make up America to-day. She is also the centre of business

administration and finance, whose tentacles reach out into all aspects of American business life, and are now reaching out to conquer the financial world beyond the Atlantic. Finally, her buildings may serve to typify American life, ever lifting itself triumphantly above natural limitations and difficulties inherent therein. All of these aspects of the activities of New

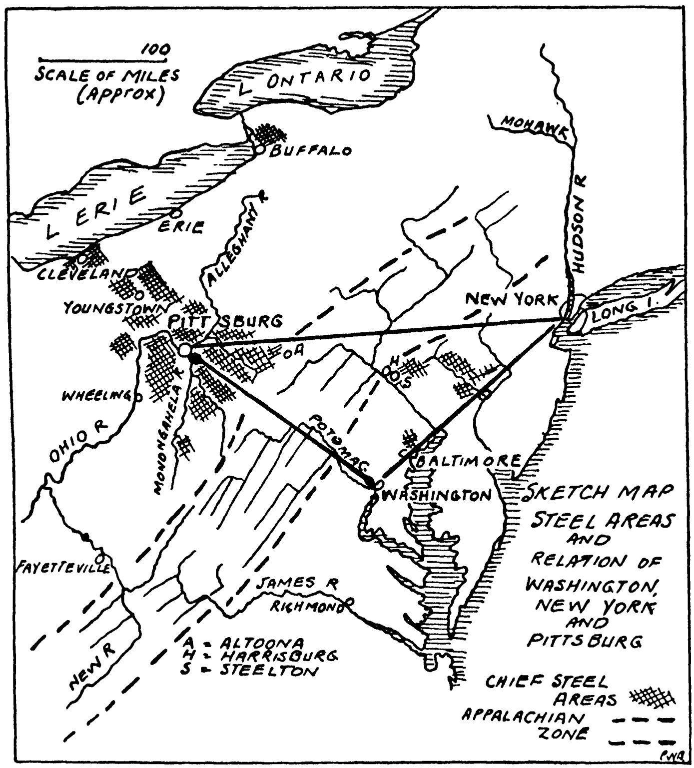

FIG. 74.—SKETCH-MAP, STEEL PRODUCTION, EASTERN NORTH AMERICA.

York are concretely expressed in the forms of her cultural landscape, that is, in her harbour works and warehouses, in her Immigration Department, in her many racial elements and quarters, in her bridges and tunnels and vast network of systems of communication, in her Wall Street and all that it connotes, in her great skyscrapers towering heavenward on every hand.

And what can we say of Washington? Here we have something very different. It is the centre of federal administration and conservation, the home of great scientific institutions, a great national shrine or series of shrines at which all America pays homage, a natural contact point between north and south, where the soft southern drawl mingles with the harsher northern tongue, and finally a growing international centre, the home of meetings and conferences of which that under Mr. Secretary Hughes's leadership to limit armaments was perhaps outstanding in promise and conception, and in which lies much hope for the future of mankind. Again we see this objectively depicted in the inhabitants, in the buildings housing the administration, the embassies, the scientific societies, the memorials and monuments, the beautiful layout of the avenues and open spaces, and the edifice housing the Pan-American Union.

And Pittsburg, of it what can we say? It is in some respects a sad commentary on modern life to admit that it is such cities as Pittsburg in the main which make the other two possible. For here is the backbone of modern civilisation, the heart of the industrial life and major mechanical productions of the country; the city of steel rails and sections of bridges which make our transportation systems practicable; the city of steel billets and machines and rolling stock on which manufacturing production depends; the city which manufactures the great girders for the skyscrapers and the piping for oilwells, on the output of which modern road transport depends. Her coal mines, her steelworks, her rolling mills, her steam barges and tugs, her factories and office buildings, her municipal apparatus, her varied population, and her many other adaptations of nature, express her relationship to nature. She and her like form the basis for much of the finance of New York and go far to provide the sinews of war for the administration, the scientific activities, and the memorials of Washington. She is a city unlovely and unloved, yet tears from the very bowels of the earth the framework, the essential framework, of our modern material civilisation.

That outstanding geographer, Sir Halford Mackinder, has recently said of another great city, "The London of to-day is a vast organ in the anatomy and physiology of the Earth's surface, a deposit of several million human beings interrelated in the most vital and complex ways with one another and with the soil on which they are placed. The geographer has to appreciate and weigh that great fact." [2] This interrelationship between man and earth is concretely expressed in the cultural landscape, that is, the natural landscape as modified by man. As one goes about the world of to-day one sees the many features of the cultural landscape set in a natural environment by man. They definitely challenge explanation in terms of that environment. We have here briefly examined three great deposits of "human beings interrelated in the most vital and complex ways with one another and with the soil on which they are placed," and have seen something of the main features of the cultural landscapes resulting from the efforts of the American people to satisfy the need for a great port, a great centre of administration, and a great modern workshop, with their related activities.

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Chapter 15

THE CULTURAL LANDSCAPES OF RECREATION AND THE GRATIFICATION OF THE ÆSTHETIC SENSE

The cultural landscape considered as an adaptation of nature in the effort to satisfy man's desire for recreation. A classification of recreational areas. The sand dunes, parks, and forests of Michigan, and the sand dunes and marshes of the coast of Norfolk.

BY some geography has been defined as the occupancy and use of land. In this view a survey is made to study the character of the occupancy, the nature of the land surface, and the use to which it is put. The chief defect of such a method, unmodified, is that it tends to lead to a consideration of specific types of products in relation to soils, etc., rather than to a study of the relationships of definite communities, regarded as entities, to the environment in which they are placed. The idea of wholeness, which seems essential to modern geographical conceptions, may thus be missed. With this point clear in mind, the method contains within it the essence of geographical practice. On it can be based the attempt to explain why certain areas are used for certain purposes rather than for others, why other areas are not used at all at present, how far it would be possible, in the future, to use areas not at present used, and what is the best use to which those areas could be put. It further leads to a consideration of whether it would be possible to use certain areas more effectively than is being done at the moment, and, if so, for what purpose could they be best used. It is with these latter points that we are chiefly concerned in this chapter.

In any such study as outlined above, we find certain areas used for recreational purposes. In other words, they are not

primarily used with a view to making a profit by producing some commodity as food or other raw material for the benefit of the community, but are occupied by people who are relaxing from such activities, and are in pursuit of health or pleasure or both. We find much other land, varying markedly with the type of country studied, which, while not so used, is eminently suitable for, and will inevitably be in demand for, such uses in the near or distant future. This is particularly obvious when we bear in mind the growth of the world's population, especially in the form of great city conurbations, and the increasing realisation of the need for fresh air and change of scene for the inhabitants of such areas.

Little so far has been done to study either the present occupancy or the possible future occupancy of such regions. Still less has been done with a view to explaining on geographical grounds, i.e. in terms of the natural environmental complex, why recreational activities have developed in certain areas rather than in others, or to estimate how far such activities may usefully develop in districts at present unoccupied, or occupied by a less suitable type of activity, unlikely to maintain itself there under the rapidly changing conditions of modern times. Very definitely related to the environmental complex are the parkways and bathing beaches of Chicago, the summer homes of the Dune country in Michigan, the seaside resorts of Long Island or the south coast of England, the tourist centres of the English Lake Country, the Cairngorms, or Switzerland, the playing-fields of the Lea valley north of London, or the casinos of the Riviera. Many others, less well-known, await geographical study. Possessing advantages for similar and related uses are such areas as the northern forested region of the Michigan peninsula, heathlands and sandy districts in England, mountain lands in Scotland, and poor agricultural land in nearly every country.

Such areas are capable of clear-cut classification which might tentatively be of a threefold character, according to the guiding principle adopted. This could be based either on the predominant type of people occupying the recreational area,

or the use to which the land is put, in the sense of the chief activities carried on, or the character of the natural environmental complex.

From the standpoint of the first principle of classification, the Riviera could be regarded as a region occupied mainly by rich people who have mostly retired from business or other activities, and have settled there to enjoy themselves, under the congenial social conditions to be found amid the scenic beauties and excellent climate of the Mediterranean coast. The tourist centres of the Lake District, North Wales, or Switzerland, are mostly occupied by people who are only temporary visitors, vacationists, relaxing, for the longer or shorter periods during which, in each year, they are able to get away from their ordinary avocations of producing goods or performing services for their fellows. Other areas, such as the south coast resorts of England, might be regarded as intermediately placed between the first two, for many of the people in and about them are definitely retired from the East or the Army, as at Worthing, but such towns are also visited largely by temporary visitors from the commercial centres. Closely linked to them, in classification, would be centres like Brighton, which, while to some extent peopled by the former class, are probably more dependent on visitors of the vacationist type, and week-enders. A further class of recreational areas are those which provide for the temporary daily or week-end relaxation of the many thousands who are steadily at work in our great cities. These range from seaside and health resorts through parks, botanic gardens, heaths, commons, to playing-fields and bathing beaches.

Following the second principle of classification, that of the use to which the land is put, we would have such groupings as seaside resorts, at which bathing, fishing, and boating are the chief activities ; health resorts, such as Buxton, where people go primarily to drink the waters of the mineral springs ; playing-fields, or race tracks, at which those looking on at the specialised activities taking place are the chief elements of the cultural landscape ; house of entertainment, such as cinemas,

concert halls, and theatres; and hunting areas and game preserves, public and private.

The third principle of classification, that based on the environmental complex, is of great value in regions which, from the standpoint of the cultural landscape, are at present either negative or are occupied by decaying activities. It is, therefore, most useful from the regional planning point of view. In a recent regional planning survey [1] with this end in view, the countryside has been divided into five categories: 1. Low-lying sandy coastal areas and land liable to flood; 2. Normal agricultural land of no special interest; 3. Agricultural land of striking landscape value; 4. Wild land, characterised by remoteness, or loftiness, and usually absence of human habitation; 5. Features of special scenic beauty, which usually fall within the classes 2, 3, or 4. The scheme recommends that parts of such land be set aside for future recreational, or æsthetic uses, under three heads. The first comprises open spaces, and parklands, and features of special beauty to be set aside as reserves and playgrounds for the people of the region. Many of them lie along beautiful river valleys. The next are parts of category 3 above, the regions of special landscape charm in the agricultural areas, to be preserved as far as possible from unsightly structures and other defacements which would diminish that charm by introducing building and housing schemes, in which the type of architecture and the material would be out of keeping with the present beauty and attractiveness of the region. Lastly there is the wild land, which it is definitely proposed should be set aside as national reservations as circumstances permit. This regional plan further considers that some five acres per 1,000 people in a region should be set aside for these purposes, and recommends, as an ideal to be aimed at, that of this two-fifths be devoted to play and three-fifths to other purposes. In certain German schemes on similar lines, the proportions are one-fifth to play, three-twentieths to ornamental parks, and thirteen-twentieths to woodlands [2].

On the basis of the environmental complex we may, per-

haps, recognise at least eight major types which may be suitable for recreational or æsthetic use. The first of these comprise features of special scenic beauty. The Gorge of Cheddar, Dovedale, and Symonds Yat are examples. Mountain lands, plateaux, and moorland come next. Ben Lomond, the Lake District, and the Scottish moors may serve to illustrate. Wooded lands, where soil conditions and rough topography make agriculture impossible, as in much of north Michigan or round the shores of Lake Superior, are our next type. Agricultural lands of exceptional beauty due to varied topography, interesting villages and houses, with pleasant hedges, lanes, and patches of woodland, may well be protected from ribbon-road development and suburban settlements to remind us of what much of our English countryside around the large towns once looked like. The many heathlands and commons on sandy patches, too poor for agriculture, are admirably suited for playgrounds, golf courses, and other recreational activities. They are found in plenty in Norfolk, and around Bagshot and other districts. So also marshy areas, both salt and fresh, as in Norfolk, unsightly lake edges, as at Chicago, and river flood plains, too wet for agriculture, as along the Soar, or Trent, can be put to many excellent recreational uses as playing-fields, or shooting and boating areas. The sandy beaches, or sand-dune areas, along our coasts make golf courses and bathing beaches as at St. Andrews or Atlantic City. Lastly, lands now occupied for logging, or slowly declining cattle industries, will, when logging ceases, and competition from more favoured areas kills the livestock industry, be available for such recreational purposes as hunting, fishing, and camping.

Parts of such land are already in process of passing into public hands for recreational uses. The great forest reserves of North America, the acquisitions of land by the National Trust in England, the gifts of beauty spots to the people by private donors, as in the case of Bradgate Park in Leicestershire, the purchase of such areas by public-spirited committees, as in the case of beautiful Swithland Wood in the same

county, and the gift of farm land in trust to preserve its scenic beauty, as in the case of the Langdale Farms in the Lake District, owned by Professor Trevelyan, are all examples of this process.

It is not suggested that the above is an exhaustive classification of such areas, but it may serve as a background for an examination of the cultural and natural landscapes of certain areas of these types in detail. We have already discussed

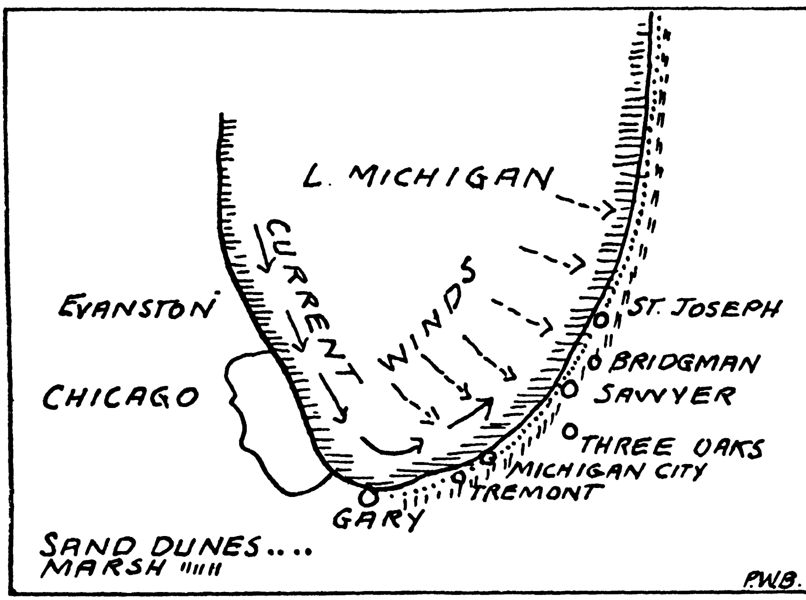

FIG. 75.—SKETCH-MAP, RELATION OF DUNE COUNTRY TO CHICAGO.

some of the recreational amenities provided in the city of Chicago. Here in the metropolitan area of, and surrounding the city, there are to-day close on 4 million people. It is therefore one of those regions in which the problem of adequate recreational facilities, more especially for those engaged in working all day, is acute. The problem is accentuated by the apartment house, or flat system, which usually implies the absence of any attempt at a garden—an amenity more commonly found in and around British cities. It is accentuated also by the summer climate of the city—the mid-continental type, with its high temperature, its thunderstorm character

of rainfall, and its excessive humidity. In part, the needed recreational facilities are provided, as we have elsewhere described, but the real seaside of Chicago lies southwards and eastwards across the lake (Fig. 75). Beginning at Gary and running north along the east shore of Michigan is a zone of dunes rising in places to 400 feet, from a quarter to twenty miles in width, 100 miles in length, and for variety and interest reputed, by Professor Cowles, the famous botanist of the University of Chicago, who has made a life study of them [3], to be the grandest in the world.

The first forms of the cultural landscape to develop in this dune area and in the immediate hinterland were the camps of the loggers, the railroads which they built to the lake shore, and the little piers, from which the wooden schooners of those days carried the timber to Chicago. With the cutting out over this area of the best stands of white pine, the industry disappeared, and the towns related to its growth languished and decayed, the logging railroads went bankrupt, and were in many cases abandoned. People here will still tell you tales of the last train to use some of them. The logging camps disappeared, and other forms of the cultural landscape slowly rusted or rotted. Then with the growth of the city, and the development of steamer traffic, around the little ports grew summer resorts. Here came families of Chicago business men to spend the summer. If not too far out, the menfolk came for the week-ends; if too far out, they came for their vacations. So slowly around the little ports, within a mile or two, or easy reach by horse transport, the region began to take on a new cultural landscape, that of a temporary seaside residential character. With the development of another system of railroad transport, the Père Marquette, built mostly of bits of the old logging rails, more people came in, and the region took on, in bits and patches along the coast, a new lease of life. Still much of it is undeveloped. Wherever a road led down to the beach, there people bought land and put up shacks or summerhouses to sleep and eat in, and lived out of doors on the lake shore or in the forest behind. Chicago Clubs, such as

the Prairie Club, bought land and developed country clubs with artistic summer dwellings for their members. Land which was farm land, and once ran down to the shore of the lake, on country which did not pay as farm land, is now attaining a new value for recreational purposes. This is mainly due to the increasing demand for frontages on the lake. Many different classes of Chicago people go to the dune country. University professors rent cottages for the summer, business men drive eighty to one hundred miles by road to spend the week-end, hairdressers reach the dunes, to visit their families, late on Saturday night, and go back early on Monday morning. So we see the decay of one cultural landscape and the development of another, under the combined influence of a partial change in the environmental complex through the disappearance of the white pine, and the growing demand of the great city for recreational facilities.

This is one of the most attractive pieces of country in North America (Plate 42). Let us visit it and see something of its character and the secret of its charm. From 63rd Street we take train for Tremont at the entrance to the Indiana Dunes State Park, a section of the dune acquired by the State to provide amenities, and, at the same time, to preserve in the interests of those amenities as much as possible of the natural beauty of the dune land, and to limit the cutting away of the dunes to obtain sand for Chicago Steel enterprises —a fate which befell the dunes round Gary. Leaving the station, we soon reach the great marsh which, almost throughout its length, backs the dune country, separating it from the fruit-growing region behind (Fig. 76). This marsh is due to the interruption of the normal drainage caused by the dune formation. Its chief economic value lies in the many patches of bilberries, which in the proper season are alive with pickers, who come on foot and by motor, and pay the owner of the marsh, on whose particular property the patch may be, 10 cents for the right to pick. There are hundreds of such bilberry marshes in the dune country. Crossing the marsh, we enter the forest which clothes the dunes. We can then either

climb over the dune, in height from 50 to 400 feet, varying with the place, or use one of the roadways through. It is more interesting climbing, and passing over the top, we look down on the foredune, the beach, and the clear waters of Lake Michigan, sparkling in the sunshine, a hundred or so feet

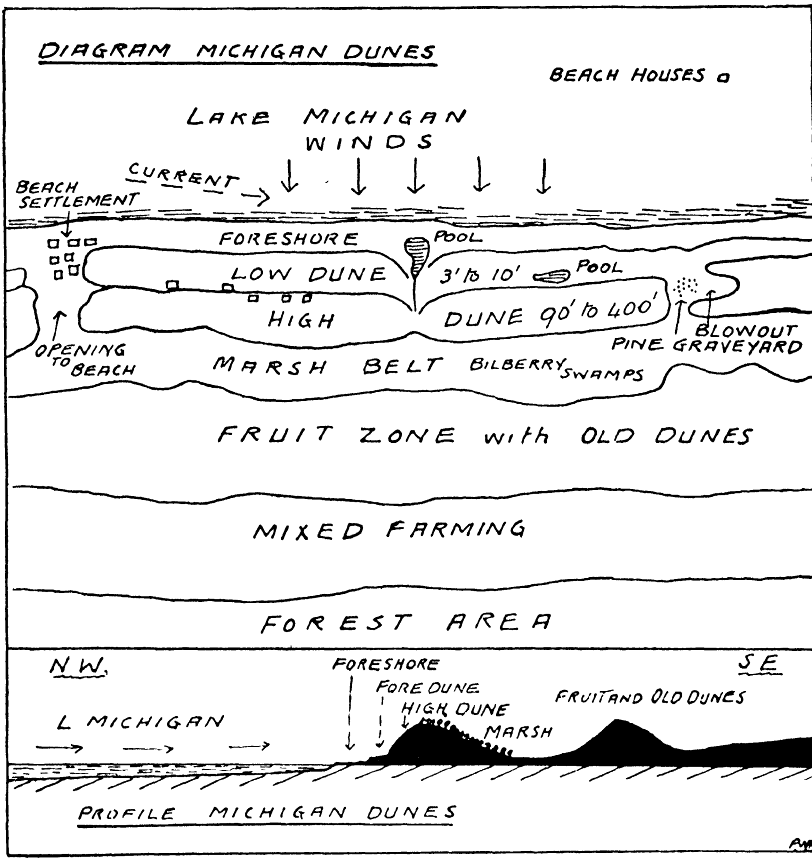

FIG. 76.—DIAGRAM AND PROFILE OF DUNE COUNTRY, MICHIGAN.

below. Near the shore floats an Indian canoe occupied by two boys in bathing-suits, while on the beach a camp fire burns in charge of scouts busily preparing a meal. The canoe, though smaller, is similar in type to those in which La Salle, Père Marquette, and their compatriots roamed this country from the Mississippi to the St. Lawrence, when it was only

peopled by Indians and wild beasts. To left are the ruined stumps of a logging pier, artistic in their ruin.

At our feet is a flight of rough wooden steps thoughtfully provided to facilitate descent. Down it we clamber to the foredune and thence to the beach, and look back at the towering edge, tree-covered, with here and there among the trees and along the foredune, picturesque wooden chalets, the summer homes of tired Chicago business folk (Plate 42).

How came these massive sand ridges here, how came they clothed with forest, and how came the great openings down the 100-ft. side of which we see the scouts busily engaged in sliding? The source of it all lies westward across the lake, where north of Evanston, the southward moving current of Michigan is steadily eroding the foreshore and sweeping the sand round the head of the lake to the eastern shore. Piled up by the storm winds, rapidly dried by the north-west and south-west winds, which attain a high velocity in crossing the wide expanse of water, the sand grains are carried inland. A slight obstacle, a bunch of saw grass, a juniper bush, a car rut, a pile of pebbles, is sufficient to cause lodgment. Interlaced branches of young trees and shrubs enmesh the sand. The building of the dune has started. The dune is then itself the cause of lodgment. Up the face of it and round its flanks more sand moves. The dune moves forward. Low forms of vegetation—the grape vine, couch grass and similar types, take root [4]. They bind the dune together. Their roots and vegetative parts decay. A layer of humus forms, 1 or 2 inches per year. Bushes and shrubs take hold. The dune is stabilised for a time. Its growth is slow. It may in two years' time reach a height of 2 feet, in nine it is shoulder high. The present dune development stands for hundreds of years of nature's effort.

The forest cover is slow in coming. But one tree can stand the *open* dune. Of the poplar species, it is the cottonwood whose seeds germinate in patches of wet sand beyond the reach of heavy waves. It grows with the dune, flourishing as the sand buries it, sending out great roots along its buried stem.

What look like low cottonwoods on top of a dune may have their main roots 100 feet below. It is thus the mainstay, the backbone, of the dune. Under its shade, in the accumulating humus, and partly protected from the full brunt of the wind by the growth of the foredune, vegetation grows more abundantly. Junipers, pines, oaks, hickory, beech, and maple appear with a dense undergrowth of shrubs and flowering plants [4]. The foredune develops with a cover of low cottonwoods, marram grass, horse tail, and willows. Its edge is cut steep by the storm winds from Michigan. Between it and the main dune, attractive pools and ponds appear, the drainage from the dune. They are fringed with grasses and sedges, pondweed, and milfoil. Valleys develop, ravines are cut, the dunes are 'fixed,' the stage is set for man.

Man and nature combined, however, operate to alter the appearance of things. The term 'fixed,' as applied to the dunes above, is relative. The cover of soil on the dune top is thin. The only vegetation with a real hold is the cottonwood. A great storm from the lake, sweeping over the dune top, uproots a tree, or clumps of trees, tearing with them the soil in which they grow. The exposed sand beneath is rapidly attacked, the neighbouring vegetation is undermined. A great steep slope of sand results, what is called a blowout appears, and the dune moves forward, burying forests in its progress inward. The dune becomes a 'wandering' dune, its movement only ceasing when the supply of new sand gives out through the growth of other dunes to lakeward. Where it has passed over a forest (Plate 43) the tall, gaunt ghosts of the dead, buried pines appear in its wake, forming a pine graveyard, a vivid expression of the natural forces at work on the Michigan shore. Blowouts also start as a result of man's adaptations of nature. The quarrying of sand for Gary, the cutting of trees, and the hauling of logs across the dunes to the lake piers, broke down the soil cover, exposing the sand to wind attack, much as the cutting of timber on the Sierra Nevada in California exposed the surface to rain erosion. Breaking trail through the forest is sometimes sufficient to lay

the ground open to wind attack, and the forest commissioners are to-day very strict about the breaking of new trails, existing trails being marked and watched.

Fire constitutes another of the problems of dune protection. The great forest cover is easily fired. A striking form of the cultural landscape of the conserved parts of the dune country is the fire-watcher's tower, a tall, slender structure rising high on a prominent dune from which a fire can be detected in its early stages and help summoned to control it (Fig. 77). Such fires may easily bridge the marsh, and carry to the farming country or forests beyond, causing great damage to the cultural landscape and the possible future use of the forests as timber or as recreational areas.

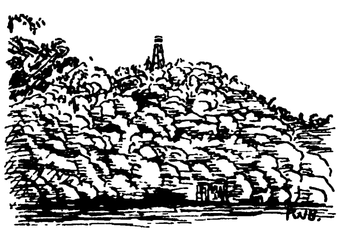

FIG. 77.—FIRE WATCHER'S TOWER, MICHIGAN DUNES.

In the farming belt near the dunes a new life is developing with the market afforded by the coming of the recreational element to the foreshore. Milk, butter, eggs, and fruit find ready sale. The little towns are developing cinemas. Their stores find it profitable to vary their supplies. In the stores one can readily detect two main classes of goods—the stock goods, caps and clothes and hardware, in demand all the year round by the farming people, and the special lines, such as bathing suits and knick-knacks required by the floating summer population. The blueberry marshes have also taken on a new lease of life.

The recreational use of the dune country takes many different forms, but essentially they are those which are connected with the water's edge, bathing, suntan, picnicking, canoeing, motor-boating, fishing, and camping. Many live most of the day in bathing suits. The water is delightfully warm, yet cool by contrast with the air temperature. It is pleasantly clear and clean, which cannot always be said of that of the Chicago bathing beaches. To bathe and picnic on the beach

by a roaring camp fire of gathered driftwood and old sassafras poles, in the pleasant cool of the evening, contrasting vividly with the hot Chicago nights, and even those of the farm land back of the dunes, is to appreciate something of what this region means in terms of the city's recreational facilities. After a hearty supper, in which the *pièce de résistance* is a delightful chowder, we lie back and watch the sparks fly upward against the deep indigo of the rapidly darkening sky, from which the sun, a large looming red ball in the distant purple haze over the lake, has just sunk below the horizon. Still later the moon comes out, its light first showing faintly in the sky behind us above the forest on the dune. Later still the fire dies down, the conversation lags, the air grows chilly. We rise and slowly climb the 100-ft. face to make our way homeward through the beech forest, mid lanes of gleaming moonlight breaking the gloom of the tall trees. Apart from its beauty and mystery, we are grateful to the moonlight, for we have left our flashlamps behind, and the forest on the inner sloping face of the dunes is difficult to negotiate once the early dark of these latitudes enwraps it. A distant glimpse of the flaming furnace tops of Gary reminds us that we are not far from the great city whose playground this is.

Such is the duneland wrought by nature's forces, modified by man. It is a land from which one cultural landscape has disappeared to give place to another ; a land whose origins lie in the dim past of wind and tide and sand and plants ; a land which nature and man are still moulding and adorning with new forms of natural and cultural expression ; a land from which man's destructive activities are more and more being barred ; a land in which man satisfies his desire for health and pleasure and relaxation from the strenuous toil and rush of American business life ; and above all, a land of changing beauty, a land of varied charm, ranging from the cool mysterious moonlight of the evening forest depths, to the noonday sunlit sparkle of the shoreward-racing waves.

The resort type of recreational use is not the only use to which the land of Michigan can be put. North Michigan is

part of the Laurentian Shield, a region of rough topography, a veritable maze of rock and stream and lake, covered with forest, once logged over, now the home of deer, rabbits, fur-bearing animals, partridge, and wildfowl, with here and there, in open patches, a decaying ranch. The heavy winter snowfall, the short pasture season, the depredations of wolves driven south by hard conditions in the north, the distance from markets, all combine to render ranching unprofitable. The white pine, slowly replacing itself, takes long to reach the sawlog stage. Though second growth is soon available for pulp and posts, these latter products have not a high cash value in competition with better-placed supplies elsewhere.

In face of ineffective competition for other uses, its value as a natural recreational area for hunting and fishing is becoming high. Such value, in the main, is a function of its capacity for carrying deer and partridge. Game laws and fire protection increase this value. Much land is in the hands of private hunting clubs, and much is also passing under State control as reservations, in which hunting is permitted under licence and regulation as to season and bag. The State is also stocking such lands. Maps showing soils, cover, and topographical features, with stream and lake and economic distributions, are prepared by the Land Economic Survey [5]. These form the essential basis for the scientific administration of such lands, and are a model for similar areas elsewhere. The recreational value of such lands depends chiefly on their capacity to carry game. This in its turn is a product of the natural suitability of the region, the depredations of natural enemies, the extent of protection afforded, and the number of hunters.

On the north coast of Norfolk (Fig. 78) there is a region which in part resembles and in part contrasts with that of the Michigan duneland which we have studied above. Let us examine its cultural landscape with a view to developing these contrasts and similarities from both the cultural standpoint and that of the environmental complex. Running along the coast of Norfolk, eastward from the seaside resort of Hunstanton, we come to a little village at the head of a creek

called Overy Staithe [6]. As we approach the village we pass on our left an Automobile Association hotel, once a flourishing malthouse, to which schooners by the creek brought coal, and the surrounding farmers brought barley. It is a unit of the cultural landscape converted and adapted to its new purposes. Stopping at it we find men in shooting-jackets. Others in jerseys and pullovers are starting for the quayside with fishing-tackle

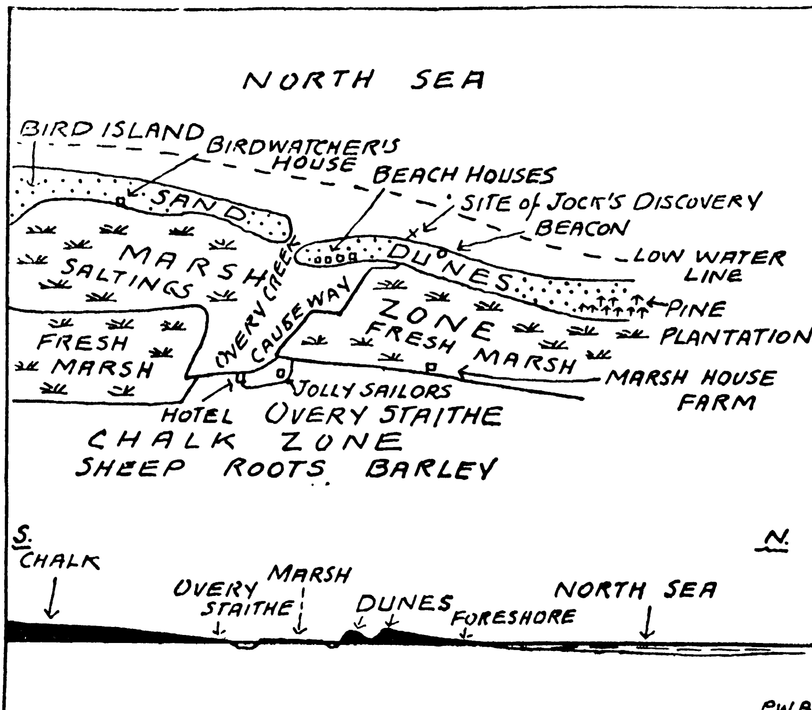

FIG. 78.—SKETCH-MAP AND PROFILE, OVERY STAITHE AREA.

and sails. Still others are in plus fours and carry golf-clubs. Girls in khaki shorts are setting out for a long tramp equipped with haversacks. Another group with bathing togs, towels, sandwiches, a rucksack, a tea kettle, and a rough-haired terrier, is moving down the little village street with obvious intent of making a day of it. Let us follow them on the 2-mile tramp to the outer shore.

We stop twice in the village. Once at the Ship Inn for

stone ginger beer, and again at a little general store to send off some postcards and buy some fruit. The store is smaller than those of Michigan, for near by is Burnham Market, where most of the farming folk get their supplies, but otherwise with its general assortment of two classes of goods, it is very similar. A few houses face the creek. Opposite a long rambling structure used for boat-building and repairing is a small group of sun-tanned fishermen getting out sails and oars. In the creek, riding at anchor, are many small sail-boats. On the boat slip a boat is being equipped with sails and fishing-tackle and a lunch basket. Close by are a couple of motor launches, one of which with motor chug-chugging is circling in to the slip where a party, ready for the day, is waiting to go on board. A little farther on we pass a group of mussel pits and come to a gate leading to the end of a long, rough causeway built of great chalk blocks from the back country, one of the seaward ends of the great chalk block which sweeps across England from the Severn to the North Sea. This causeway is man's work, not nature's, the result of his struggle to separate the fresh and salt-water marshes, the latter flooding under certain conditions of wind and tide. Over a mile in length, it leads to the low line of dunes which we see on the horizon.

To our left lie the salt marshes, or saltings, separated from us by the creek (Plate 44). Here and there along the creek side are tall posts to guide boats when the saltings are covered, and to mark the deep-water channel. In the distance on the saltings are what look like a collection of rounded whitish stones. They are sheep, driven there during the day to graze on the rich salt vegetation which is very fattening. At night their herders, who are always with them lest they get into difficulties in the many water channels which intersect the marsh, drive them back on to the fresh marshes behind the embankment. This is the summer routine from April to October. In winter they are taken back to the farms on the 'Good Sands' district of Norfolk, lying behind the marshes, and fed on roots. This system of husbandry goes back to the days of Coke of Holkham, near by, who revolutionised the farm

practice of Norfolk [7]. Up to his day much of what is now covered with prosperous farms was poor sandy country, in which it has been said that two rabbits fought each other for a single blade of grass. By careful cultivation of the light soils, the introduction of root crops on which the sheep are folded, followed by a barley crop and the establishment of good kinds of clover, rich farming on a large scale has become practicable. To these areas, the reclaimed marshlands, both salt and fresh, are a valuable adjunct. The relatively dry late winter and spring of eastern England and the abundance of sunshine help the district as a producer of barley and wheat.

To east from the causeway we look across the fresh-water marshes (Plate 44). In the distance are little clumps of farm buildings, the marsh farms, which supplement their normal incomes by taking in summer visitors. Here herds of cattle as well as sheep are dotted about on the many patches of rich grassland between the artificial water channels which man has provided for reclamation and drainage purposes. Similar fresh-water marshes and farms lie beyond the saltings to west.

Approaching the line of dunes, we see on the landward side, sheltered from the rough blasts from the North Sea, a line of beach houses, rough wooden structures, leased to summer visitors at an annual rental of £9. At our feet, as we leave the causeway to pass through an opening in the first line of dunes, the salt marsh is pink with marsh flowers. The varied vegetation of dune, saltings, and fresh marsh make the region a veritable botanical paradise, a Mecca for those whose interests lie in plant ecology. Ahead of us is the main line of dunes; between, a wide depression with one or two beach houses to left; but to right, the open landscape as nature left it, a broad expanse of sand and gravel covered with typical dune vegetation, in which bright pink bells make charming notes of colour. It is a sheltered, delightful spot. We keep it in mind for picnicking on windy days.

Crossing the main dune we find another sheltered spot.

We strip and bathe in the fresh, invigorating salt waves sweeping shoreward over stretches of clean, yellow sand. After a hasty, welcome lunch, we study the dune.

Although, in reaching this spot, we only referred to two

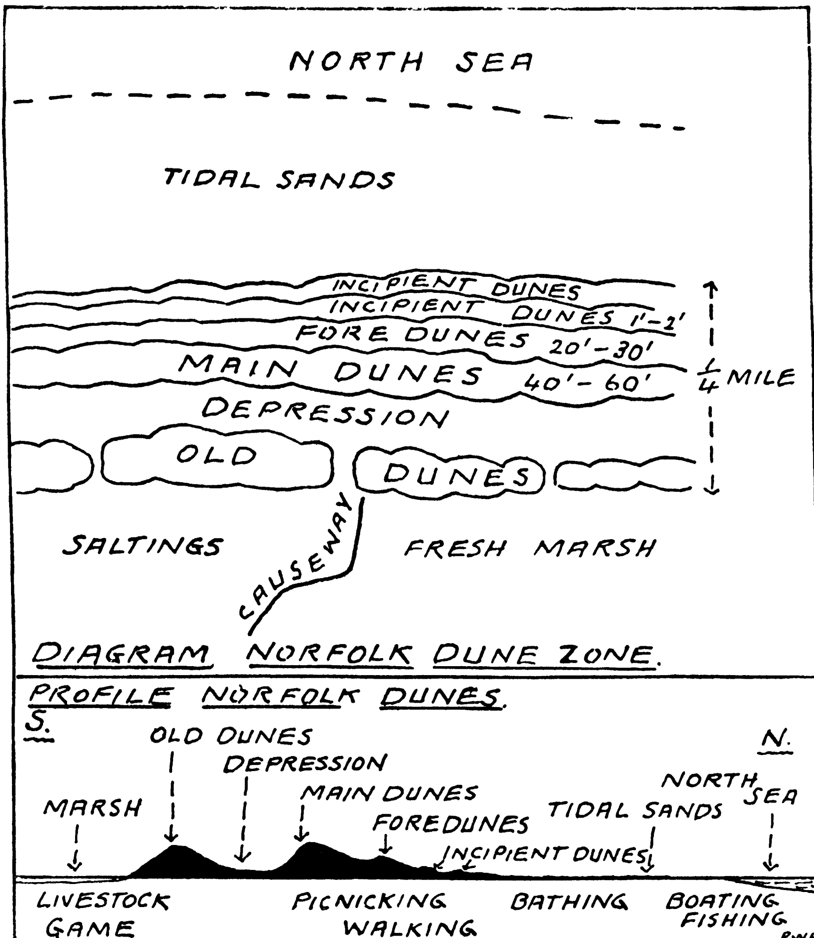

FIG. 79.—DIAGRAM AND PROFILE, NORFOLK DUNE ZONE.

lines of dunes, it is possible and helpful in grasping their formation to recognise five. The old line of 'fixed' dunes is separated by the main depression from the chief line (Fig. 79). The latter varies in height from 40 to 60 feet. At its foot is the foredune (Plate 45), still building, and from 20 to

30 feet high, covered in patches with two kinds of dune grass, the one a wiry sharp-pointed grass, blue green in colour, the other a more numerous species of marram grass, is of a yellowy green shade and is more plentiful. With the buff-coloured sand they make an effective combination. Below the foredune, in broken strips, is a zone of incipient dunes, 1 or 2 feet in height, forming in lea of clumps of marram grass. To seaward of this line, but still above tide-level, is an outer zone of incipient dunes, little heaps of sand, 1 to 4 inches high, behind the slight obstruction caused by shells, bits of driftwood, small plants, and like objects (Plate 45). The general shape of all the dunes is convex to seaward and concave to south, an indication of their origin.

It was our habit to put the wire-haired terrier in the sea and then, to warm him and keep him busy, set him to work to dig at the foot of the foredune. In two days' work he dug a great hole some 3 feet deep which proved very useful in our investigation of the origin of the dunes. Deepened, and repeated elsewhere, it showed us a series of old beach levels, well marked by layers of shells, pebbles, grass, and bits of wreckage embedded in the sand (Plate 46). Clearly this coast is building out to sea under the combined influences of sea and wind and gale and sand and sun. One morning, after a northerly gale the night before, we had an excellent opportunity of studying the process in full swing. As the tide recedes and the exposed surface dries under the sun and a stiff northerly breeze, the sand moves in low, dense clouds, 6 inches to 1 foot in depth, across the quarter-mile of beach to the foot of the dunes. Nor does it stop there, but is carried up the face, with such strength as to make it difficult to stand against it, so strong is the cutting force of the sand grains. To test the effect, we make hollows 2 inches deep and 3 to 5 inches across, in the foredune. These fill and completely disappear, at varying rates depending on position and size of hollow. The times vary from five to twenty minutes. The main movement of sand takes place up the hollows between the dunes. Sand moves up a 45° incline at a speed little short of amazing. In the hollows it moves in

a series of short jerks, depending on the fluctuations in the force of the wind.

In making these hollows we note the amount of water present on the foredune top a few inches below the surface. Later investigations show that this is always so. The surface sand apparently functions, as does a surface mulch produced by hoeing a garden, to prevent evaporation, and this accounts in part for the surface vegetation of the dunes, which even after long spells of dry weather are moist with fresh water a short distance below the surface. At places here and there, though on a smaller scale than those of Michigan, are 'blow-outs,' produced no doubt by some great gale.

Turning east along the beach, we come to an old beacon, a decaying item of the cultural landscape needed when shipping was more important to Overy Staithe than it is to-day. A little farther on we reach a plantation of pines on the dunes, forming cover for thousands of rabbits, which are found in plenty round the sandhills. Shooting, strictly preserved, is indicated by the sharp crack of a keeper's gun behind the trees, and a stern notice anent trespassers within the plantation.

Some days are wholly spent on this delightful beach, bathing, reading, studying the dunes, and even sometimes sleeping. On others, we take a motor-boat down Overy Creek to Scolt Head, the Bird Island, to visit the bird watcher stationed there on these outer dunes and spits to study bird migration and breeding. On our right, as we turn up Norton Creek in lea of the island, we see the bird-watcher's hut nestling in a sheltered hollow of the dune—the only element of the cultural landscape in sight beyond our boat. We land on a long shingle spit. The ground is so covered with nests, eggs, and young birds, that we have to pick our way carefully to avoid treading on them. Sea holly is a characteristic plant here. With the help of a slight shelter of sacking, we photograph a Ring Plover sitting on its eggs, laid in a slight hollow in the sand (Plate 45). Here, on the island, migratory birds come to breed, and here much good work has been done in studying their movements, and a basis laid for a bird reservation of the

future, which will limit beach settlement, and preserve a piece of attractive natural landscape for future generations of visitors.

On our return run we have the good fortune to see the saltings flooded. This only happens after a combination of full moon and northerly wind, which piles the water in through the opening between the Bird Island and the main line of dunes to east. From the saltings birds rise in clouds. They never nest there, but go there to feed. Mallard, teal, and (rarely) geese are the chief birds found there. They explain the presence of the shooting-men in the hotel. The shooting on the saltings is free, but elsewhere in the district it has been mostly taken by a syndicate, a number of men who have got together to rent it for recreational use.

A mile or so to west of our position the dunes are utilised by the Royal West Norfolk Golf Club, providing a course with few equals on land which, apart from this use, would be as nature left it. Near the Club House, the Lifeboat Station is an element of the cultural landscape rendered necessary by the sea traffic off this somewhat treacherous coast for shipping.

Looking shoreward across the flooded saltings, we see the position of Overy Staithe. It, with Wells and Brancaster, are the only points for many miles of this coast on tidal creeks. Located on a patch of gravel-covered chalk, at the end of Overy Creek, it forms a head of tidal navigation at a spot where the main road east swings northward. Nelson was born not far from here and doubtless got his early contacts with the sea in Overy Creek, visiting, mayhap, The Ship and Jolly Sailors inns. To right of the village, on a slight rise to catch the North Sea winds, an old windmill, which once was busy grinding corn for local farmers, now converted to use as a modern residence, forms a picturesque item of the cultural landscape. Running homeward up the creek to go ashore on the little jetty back of the hotel, once the scene of busy shipping, we note the low rise of the chalk country to landward, dotted to-day, thanks in part to Coke of Holkham, with prosperous farmsteads [8].

In the district we are studying we are thus in contact with two main cultural landscapes intimately related to the natural environmental complex. That to landward is composed of prosperous farms, farmers, farm labourers, working beasts, highly tilled fields, good roads, and the railway. In the main it is the expression of man's efforts to satisfy the demand for food in the form of bread and meat. That on the seaward margin, the expression of man's desire for recreation in the form of bathing, fishing, sailing, shooting, walking, and golf, is made up of boats, hotels, apartments, beach houses, fishing-tackle, guns, golf courses, and the like, including men and women on pleasure bent. The two landscapes are to some extent interlaced both with each other and the past. Shooting extends inward to the farms, grazing spreads outward to the marshes. The forms of the past are moulded anew to meet the present, as in the hotel, or left to rot and ruin like the beacon. The farms shelter and cater for some of the visitors; the boatmen still fish for food off shore. Overy Staithe is, in part, the focus of them all. It houses the visitors and some farm labourers, it meets their small needs in drink and food, hardware, and odds and ends, it handles their correspondence, and keeps them in touch through the newspapers with the world beyond. It is a starting-point from which they set out, and to which they return. In a phrase, it is a small functioning organism, the focal point of their activities.

These activities, as we have seen, are based on the environmental complex. The dunes are a natural recreational zone for bathing and relaxation; the marshlands fit the needs of shooting parties and farmers' grazing; the creeks provide sheltered waterways for small craft, and their windings test the steersman's skill; the drift-covered chalk lands, together with man's inventive genius, provide a suitable background for efficient cultivation; the sea contains fish; and lastly, the patch of hard ground at the head of the tidal creek, the river valley in the chalk behind, and the crossing main road, all combine to site Overy Staithe as a convenient node for part of the area.

Both here and in Michigan we have the combination of recreational activities and farming, of dune and marsh and dry land. We also have changing cultural landscapes with the old persisting in the new. We have, however, many contrasts of climate, topography, water, vegetation, and above all of scale. The climate while possessing relatively the same advantages in both areas of contrast between water and land, shows striking absolute differences. The dunes here are low; those of Michigan are ten times the height. The waters of Norfolk are tidal and salt; those of Michigan are fresh and tideless. Michigan's dunes are forested; the only timbered dunes in Norfolk have been artificially planted and they are the exception, not the rule. The 100 miles of dune land in Michigan make the dune area of Norfolk seem small. The cultural landscape of Michigan grows rapidly in American fashion; that of Norfolk is slow. The whole scale of things, both in the cultural landscape and in the environmental complex, is smaller round Overy Staithe, than in that of her North American counterpart. There is more of interlocking both in the human activities and in the physical setting. Yet in both districts we see man the motivating force, engaged in satisfying his needs for recreation and food, moulding the natural environment, within limits clearly defined, to his will—the relationship thus established being concretely expressed in the many differing forms of the cultural landscape in which he, himself, is the chief objective element.

In this chapter we have endeavoured to consider some of the problems arising in connection with man's utilisation of nature for recreational purposes, and the resulting cultural landscapes. We have suggested a tentative system of classification which might be applied to such districts, and have examined some of the environmental complexes now used for, and likely to be suitable in the future for, these activities. By considering certain areas in some detail, both the features of the cultural landscape and those of the physical setting stand out more vividly. In the main, we may perhaps conclude that the regions so used now and likely to be so used in the

future, are either waste lands from the normal economic point of view, or lands which are of such little value for normal activities, that their value as recreational areas greatly outweighs their value for other purposes. The characteristics of such areas, desirable from the recreational standpoint, are usually very different to those best suited for production. The beach, the dune, the heath, the marsh, forest, mountain, moor, and ridge may be regarded as nature's setting for man's relaxation. Exceptions are many, but over and above the need for such areas to satisfy man's primary wants, enough remains, if properly conserved and protected from needless spoliation, to provide ample facilities for the health, pleasure, and gratification of the æsthetic sense, of those here now and of the generations yet to be.

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Chapter 16

CONCLUSION AND REVIEW

The two approaches in human geography. The approach through the cultural landscape which clearly states the problem. The need for a clear-cut objective. A philosophical conception of the subject. The essential wholeness of the geographical outlook.

THERE are two possible methods of approach in the study of human geography. We can approach it from the standpoint of the natural region regarded as the home of man. We then begin by studying the natural region as a geographical area. The other approach takes up the study of the distribution of man and his activities in relation to the natural environment in which those activities take place. In this case our approach is definitely from the side of man, the region being used to explain the relationship which exists between him and the physical setting.

Let us briefly examine these two approaches, taking first that through the natural region. We consider the natural region. We observe that the physical setting is a highly complex affair. It is made up of a blend of the many facts relating to the earth's crust, the atmosphere, the water circulation, the vegetable and animal coverings. As we have seen, the elements composing it are structure, climate, drainage, soils, vegetable and animal life. We are immediately faced with a number of problems. Where should we begin ? What facts are we to include ? Where can we draw our boundaries ? We can begin from a number of different standpoints. Herbertson based his regions in the main on climate in relation to natural vegetation. Others have based their regions on land form. We have the further problem of whether to begin with small areas or large. Increasingly small

regional areas are being taken for study. A series of such small areas are then fitted together to form a whole.

A much more difficult problem is that of deciding what facts we are to include in our regional description. It is obvious that we cannot include in our description all the environmental facts observable. Such a study would be endless, and lead us into many highly specialised subjects. We are forced to select environmental facts. We can only do so with some objective, some criterion in view. We could take as our criterion the water circulation in relation to the physical setting, the morphological development of the region, or the distribution of plant, animal, and human life and activity in the region.

In human geography we have no difficulty. The physiographer deals with the morphological development and the water circulation. Plant and animal life in relation to environment are the chosen fields of the plant and animal ecologists. To the human geographer is left the approach through man. He selects his facts, describes them, and delimits his areas, having man's use of these areas in mind, as his criterion. If he begins from the side of the natural region, he must have man's use, in the widest sense of the term, at the back of his mind. Beginning from the environmental side, such a concept is hazy and indefinite. Until we have the major facts about that use clear in our minds we are working in the dark and wasting time. In such a region as that of Leicester, the physical environment is full of interesting facts—facts as to fossils and structure of prime importance to the geologist, facts as to botanical and zoological distributions of great interest to the botanists and zoologists. Into these bypaths the student of geography approaching from the environmental side is inevitably led. If, on the other hand, we begin our study of the region with the facts of human distribution and activity in the region, we have clearly in view a definite, concrete set of facts whereby to govern our work.

We have a measuring rod, or geographical litmus paper, with which to select and test our environmental facts. We

look back from the human facts to find the explanation. We have a concrete problem to solve. Beginning with the natural region, we are forced to work forward from what may or may not be cause to find results, for we can have nothing but hazy concepts of that which we have not yet studied.

The distribution of man and his activities does not necessarily agree with that of physiographic forms, or the distribution of either plants or animals. Physiographically, a river valley is bounded by the crest line of an adjacent ridge, or a waterparting of some other sort. This may not be a human boundary. The human boundary may stop short of it as in Alpine valleys, or extend beyond it as in many parts of central England. We cannot therefore infer human boundaries from a study of topographic form. But if we begin with man's occupancy of a part of the earth's surface, we immediately solve the problem of our units of area, and also that of the amount of regional description we are to undertake. We describe, in their due proportion, as much of the physical facts as we can show to affect human occupancy of the area. We are not then led into geological descriptions and terms which may have little or no relationship to human activity. Such terms were designed for an entirely different purpose, and are rightly used in the working out of that purpose. In much geographical writing geological description is all too frequently a mere summary of the work of geological experts, with little or no relationship to the geographical objective.

The view is sometimes held that geographers should begin with the natural region, because it is more stable than the human occupancy of that region. Such stability is of course purely relative. Natural regions are changing, and have changed all through geological history. At what stage, then, in this process of change are we to describe them? If we accept Mackinder's view that "geography proper is a description of things in the present," we have no adequate justification for discussing the physical setting before describing the facts of human use, since our principle or criterion in human geography is to examine the facts of the natural environment

from the standpoint of human occupancy and use. Since that is our criterion or measuring-rod, we should begin with human occupancy in order to have that measuring-rod clear in our minds. The relationship between man and his environment is primarily due to man's motivating force, his activities being modified by, not produced by nature.

It has been contended that this approach gives an economic bias to our work. This is only so if we limit our studies to certain aspects of man's use of his environment. It is not true if by use we mean the efforts man makes to adapt his environment to satisfy human desires. We thus include all human activities which involve human relationships to the earth on which man dwells. We then get that whole view which is so very much of the essence of human geography and human relationships to the physical setting. We lose this whole view if we merely consider man's use of nature in satisfying some limited desire to which the label ' economic ' may be applied. Even were the above contention true, we should remember that even if we limit our studies to man's use of nature in satisfying desires of an economic character, we would still be dealing with the main content of our subject, since human activity is chiefly undertaken to satisfy desires of an economic character. We need not so limit ourselves, however, since we desire in each area to find out in the fullest sense how man uses that area and its products, why he so uses it, and how far he is likely to continue to use it in that or in some other way.

Adopting the approach from the human side, the content of our subject becomes clear and definite. One of the commonest criticisms of the subject is that its exponents are all at sixes and sevens as to what it really amounts to. With the adoption of a definite viewpoint and method of approach, critics are forced to recognise the dignity and exactness of the subject, for we then deal, in the first instance, with facts that are as definite and concrete as those used in any other science, and facts which lend themselves to more exact description and record than those used in some other sciences. We are in no doubt whatever as to thefacts of human occupancy with which

we deal, nor as to the test we apply in selecting the environmental facts for descriptive or explanatory treatment. On the other hand, the approach through environment, unless we have man at the back of our mind, is inevitably indefinite, since we are faced with masses of environmental facts, which may or may not relate to man, and even if they all do, their geographical values are bound to vary enormously. It is clear that it is not nature which produces the product; it is man's method of using, or his adaptation of nature's resources which produces it. Nature fixes certain limits which man may or may not be able to override according to the extent of his knowledge and the conditions of his development. It is not the environmental setting of the Ganges-Brahmaputra Delta which produces jute. Similar settings exist elsewhere which do not produce jute. It is man's desire to produce jute in a setting which is favourable for such production, and the extent of that production within the broad limits set by nature is determined not by nature, but by the extent of the market for the product.

Whichever method of approach is adopted, our ultimate aim is the same, the study of human activity in relation to the physical setting, and the definition and recognition, if possible, of geographical areas as distinct from either merely human areas or merely natural areas. It is not contended here that there is much difference in theory between the two approaches. It is contended that the difference in the methods of approach to the problem makes in practice a serious difference to the outlook, to the results, and may lead to much unscientific (in the geographical sense) work being done, and to descriptions being given which are unnecessary. It also tends to bias our conclusions, since it lays the emphasis on natural environment instead of on the satisfaction of human desires as the originating factor.

The fundamental point to be considered here, as in all other sciences, is the objective or criterion or measuring-rod. In measuring or weighing anything, to get satisfactory results we must first make sure of our measures or weights. In

geography there is, in the writer's view, no satisfactory reason for adopting a different method. We have thus in this book approached the subject from the standpoint of human activity. In making that approach we are forced to ask ourselves how we can best take up the study of human activity. In the cultural landscape we have a concrete expression not merely of human activity, but of the relationship of that activity to the physical setting. Employing the descriptive method, we first describe the forms of the cultural landscape. Then with the problem clearly stated in our minds, we set to work to establish as fully as possible man's relationship to the natural environment.

In the foregoing chapters we have attempted an analysis of the forms of the cultural landscape with a view to their classification into elements, units, and features. We have suggested methods of studying and recording them. We have also examined some of the chief elements of the natural environmental complex, and have developed a system of classification for the forms both of the cultural and environmental complexes, to serve as a basis for the study and subdivision of geographical areas. We have also attempted to show how far it is possible in the Leicester region to reconcile divisions based on human activity with those based on the physical setting. We feel that the subdivisions thus worked out are capable of much wider, useful application, subject, perhaps, to slight modification to suit varying areas.

It then seemed desirable to apply, in a preliminary fashion, this method of study to a series of areas dealing with different aspects of the cultural landscape. The most significant and universal element in that landscape is the building. It expresses the way in which man has adapted nature to satisfy his desire for shelter. It is intimately related in the material of which it is made, in shape and size, and distribution to the physical setting in which it is placed. It is found in close relationship to all forms of man's activity throughout the world. It is chiefly dealt with in this book from the standpoint of its distribution in England and Wales. That general study has

been followed by a series of more detailed studies dealing with some of the chief ways in which man has utilised his environment to satisfy his other desires. In the study of the Corn Belt we see how man has adapted nature in a particular environmental setting to satisfy his desire for food, and to care for the surplus population of more densely peopled areas by settling a relatively unpeopled region. At Helidon we see the relationship of a small community centre to its farms engaged in differing activities, conditioned by varying physical settings. In the fruit-growing districts we have a specialised cultural landscape expressive of the greater numbers of people supported to a given area by a more intensive system of land utilisation. The study of Chicago shows us the highly complex cultural landscape of one of the great world nodal points, its varying aspects reflecting both the varied needs of man and the many differing physical settings to which they are related. Those of the St. Lawrence waterway and the Canadian Pacific Railway tell us something of the cultural landscapes evolved in solving man's transport problems in providing the needed links which bind his activities together to form that growing sense of wholeness which is more and more becoming characteristic of the economic world. They also serve to illustrate in some degree the extent to which nature helps or hinders the development of these links. The comparative studies of New York, Washington, and Pittsburg serve to bring out the diversified character of our great modern agglomerations of population and the influence of the physical setting on that character. Finally, we have seen something of the cultural landscapes produced by man's effort to utilise nature to fulfil his need for recreation and the gratification of his æsthetic sense. While the mode of analysis adopted lends itself to a separate treatment of the various aspects of the cultural landscape, an endeavour has been made to bring out the essential wholeness or unity of man's relationship to nature in each area.

Speaking recently at a meeting of the Royal Geographical Society (*G.J.*, p. 269, September 1931), Sir Halford Mackinder suggested that the time has come for geographers to " build up

a philosophical geography, originated by observation and speculation no doubt, but tested by criticism." In the foregoing chapters the writer has attempted to develop a philosophical view or conception of the subject, in tentative fashion, by emphasising human effort to satisfy man's desires, as the motivating force brought to play on nature to mould her surfaces and products to fulfil man's needs. That effort is itself modified and shaped in the process. The concrete expression of the resulting relationship between man and nature is expressed fully in the ' fixed ' and ' movable ' elements, units, and features of the cultural landscape, including, as the prime element, man himself. The description and explanation of that landscape in terms of the physical setting is thus the core of the subject—a core or heart which can be defined in terms as clear-cut and definite as any similar statement which can be made about any other science. In this view the driving force of human desires, producing the effort to adapt nature to satisfy them, is the motivating force and the unifying principle lying behind this conception of human geography.

The main viewpoint of this book is thus that human activity undertaken to satisfy human desires is the motivating force, and that man takes products and utilises natural surfaces to satisfy those desires. In this process he modifies the face of nature and his activities are in turn modified by nature. The concrete expression of this process is the cultural landscape. It is fourfold in character. It has its anatomical and its physiological side, its ' fixed ' structures and its ' movable ' elements, of the latter of which man is chief. Its ' movable ' elements, operating in conjunction with the ' fixed ' structures, and modified by the physical setting, produce the activity of the cultural landscape. The results of this activity appear chiefly in the production of goods and the performance of services. Hence these results are expressed as manufactured goods, as movement of products, as municipal and governmental services, as health, amusement, and recreation and as æsthetic enjoyment. These results can be partly measured and mapped from statistical material. Thus we have the fourfold character

of the cultural landscape : its ' fixed ' structures, its ' movable ' elements, its activity, and the results of that activity. In studies of large areas it may not be always possible to begin our studies with the ' fixed ' features, but wherever statistical or descriptive material is available, it is possible for us to begin, if we cannot adopt the method of detailed study in the field, with the distribution of man, the chief element in the landscape, and often it is possible to begin with the results of his activity as expressed in the output of crops or manufactures, or with the movement of goods or people.

The elements, units, and features of the cultural landscape can each be expressed in terms of the formula : It is a ' fixed '/ ' movable ' objective expression of man's adaptation of nature in the effort to satisfy the demand for. . . . These elements, units, and features can be combined in logical fashion to form clearly recognisable geographical areas or zones.

Hence the study of an area should, in this view, be undertaken from the side of the cultural rather than from that of the natural landscape. Hitherto in geography the approach has been chiefly from the side of the natural landscape. Mackinder, in his address at the Centenary Meeting of the British Association last September, pictured the world from the standpoint of population density, and looked to the development of a definitely philosophical conception of the subject. It is hoped by the writer that this book may serve in some small degree as a basis for such a conception applied to man and his activity in relation to nature as concretely expressed in the differing aspects of the cultural landscape. In studies based on this conception two points may perhaps be especially emphasised in conclusion. The first is that the student may usefully begin his study by directing his attention to the cultural landscape as the concrete expression of the relationship he has to study. By so doing he has a definite problem objectively before him. He has also vividly in mind the criterion which he must apply to the facts of the environmental complex, whether he does so as here advocated, or in some hazy, indefinite form, imperfectly conceived. The

second is that from the human standpoint each area studied is an organism—a complex whole—related to its physical setting as a whole. Therefore in most areas it is best so studied. One thus gets for each area, in relation to the physical setting, that sense of wholeness or unity between the parts of the human activity organism, which is of the essence of our civilisation to-day. It is found in the team spirit in the realms of sport, industry, and social activity, and it appears to be the essential hall-mark of the geographical outlook.

The approach from the side of human activity introduces a philosophical consistency into the subject. It can be expressed in a sentence: Man's adaptation of nature in the effort to satisfy human desires. The student with this in view is never in doubt as to what is a geographical fact, and he is in a position to estimate the relative values of geographical facts.

Human geography, thus conceived, has a great future, for, more than does any other science, it gives us an insight into man's activities in relation to the earth on which he dwells. As we see from the changing cultural landscapes of the past, these relationships are by no means stable. They change with man's changing knowledge and increasing desires. Only by fully understanding the present relationships can we plan wisely for the future. We endeavour in human geography to describe and explain human activities in relation to the earth as now concretely expressed in the cultural landscape, but we also seek to look beyond that description and explanation, and try to see to what extent those relationships are stable, how long they are likely to continue, and how far man may use in better and fuller ways nature's gifts, and overcome her obstacles and limitations.

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